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THE MODELMAKER

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Vol 1., No. 1 JANUARY, 1924 10 Cents.

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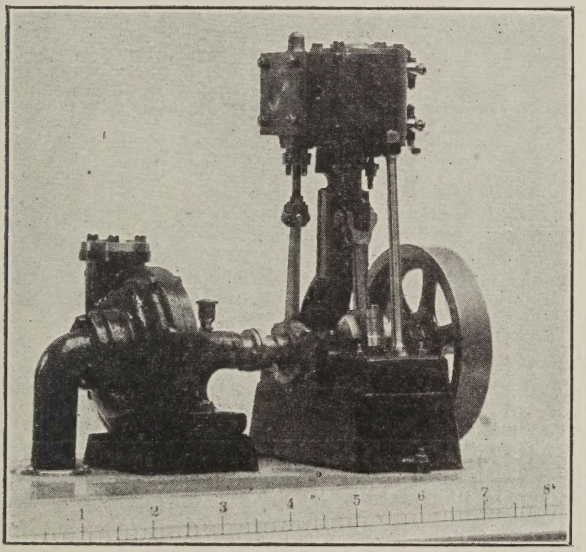

Height 6 in. x 6½ in. long ¾ in. bore x ¾ in. Stroke.

FOR SALE

THE MODELMAKER

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OUR FOREWORD

Thirty years ago Model Making as an Industry in the United States was in the hands of a few firms whose products were crude when compared with the models of today. Mr. Sipp, B. R. Wicks, Goodnow & Wightman, The Lowell Model Co., James Bell, Carlisle and Finch, Olney & Warren, and several others. The Boucher Mfg. Co., of New York, was in a class by themselves—the making of fine ship models. Parsell & Weed worked hard to develop the model business. With the exception of Boucher, Inc., all of the other firms have passed out. Peck & Snyder carried a line of model fittings and later on Frasse & Co., of Cortlandt St., put in a much larger line of imported model engines and fittings, but discontinued this line after their fire. Mr. Hopkins put a small Gas Engine on the market and the Nestor Manufacturing Co. produced the De Vignier ½ H. P. Horizontal single cylinder high speed steam engine, a very fine scale model.

In 1897 Mr. Percival Marshall, A.I.Mech.E., of London, conceived the idea of publishing a paper devoted to scientific model making and in January 1898 the first number of the "Model Engineer & Electrician" was issued. It was a success from the start. This splendid journal put a new spirit into model making and in consequence a number of new firms made their appearance to supply the increasing demands for engines, castings and supplies. A few years later the English Society of Model and Experimental Engineers was founded and to-day there are many such organizations.

Early in the '90's a number of New York enthusiasts endeavored to start a Model Engineers Society but the project did not succeed. In the fall of 1906 The American Society of Model Engineers was inaugurated in New York with Mr. F. W. Geissenhainer, President; Mr. Frank, Vice-President; Mr. W. E. Spon, Secretary-Treasurer. Five monthly meetings were held, then for lack of attendance the meetings were discontinued. A few years ago Mr. S. C. Swanson with a few friends formed the Chicago Society of Model Engineers which is now a real live organization. The Montclair Model Engineers' Club is also doing excellent work.

There are also several very successful Model Yacht Clubs in the United States. The Detroit Model Yacht Club being the latest.

Amongst local men who have helped to develop the model making spirit may be mentioned Messrs. J. C. Carrington, George Bender, T. Bray, F. A. Wardlaw, H. Beddoes, F. D. Grimke, J. F. Rapp, R. E. Miller and M. Bolles.

Spon & Chamberlain, the American agents for the Model Engineer, opened a department for the importation of Foreign Models and Supplies, but in 1913 owing to the many difficulties and delays in importation, found it advisable to discontinue that department.

The following American firms are still in business: Boucher, Inc., The Bathe Mfg. Co. and the Model Engine and Supply Co.

We believe there is a field for a small paper not as a competitor to the M. E. but one that will deal with Model Making from the American view point. The publishers will be very glad to receive notices of Societies, workshop notes and queries, suggestions, and kindly criticisms that will be helpful.

THE CONSTRUCTION OF MODEL MARINE STEAM ENGINES

By F. DRAYTON GRIMKE

A SINGLE CYLINDER DOUBLE-ACTING ENGINE, WITH REVERSING GEAR (⅝" BORE X ⅝" STROKE)

CHAPTER I.
INTRODUCTION

The writer has often admired and envied those who had the faculty for making something with only a few tools and yet turning out a first-class piece of work.

A long while ago, I acquired a set of castings for a ⅝" bore x ⅝" stroke single cylinder reversing marine engine, and when I turned over each piece of the set in my hands, unsurmountable difficulties seemed to confront me. Unfortunately my task was made harder, first on account of the inaccuracy of the blueprint, secondly my lack of tools, and thirdly because of existing conditions. In spite of these difficulties, I think I managed to successfully overcome them all.

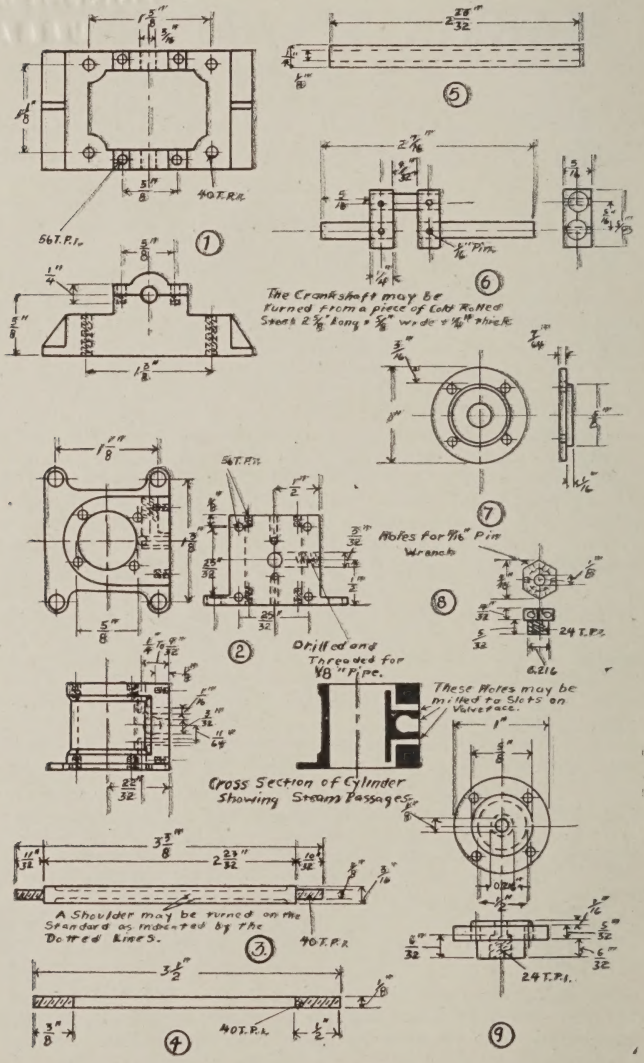
Let me emphasize an important point. **Buy the best tools possible.** They will not prove to be so expensive after all, and **only buy the tools that are absolutely necessary for the job on hand.** After two or three models have been made a fair sized collection of tools will accumulate with which any ordinary model can be made.

There should be a certain order in which the work is to be done and also a few essential tools, which are listed at the end of this article.

If the builder desires, he may eliminate the reversing gear and have a Simple Steam Engine. In this case the following numbers from list of materials, 27, 28, 29, 32, 33, 37, 38, 39, 40, 41, 42, 43 and 48 will not be needed.

The holes for the reverse lever bracket or quadrant bolts are not drilled in the steam chest. The Valve Rod yoke, Fig. 26, instead of having a slot is carefully finished to have a tongue. The tongue of yoke should be carefully fitted in the slot in the eccentric rod. The yoke pin hole is drilled as directed. The Valve rod, Fig. 25, is increased in length to 1 31/64".

BASE. The base is the first casting of the engine to be tackled. Before any drilling is done, the casting should be machined as accurately as possible. There are two or three methods of doing this. Vise and files; with a lathe; or with a shaper. When there is one true surface to work from it is easy to true up the other surfaces.


56T.P.I.
40T.P.I.
The Crankshaft may be turned from a piece of Cold Rolled Steel 2 5/8" long x 5/8" wide x 1/8" thick
Holes for 1/16" Pin Wrench
24T.P.I.
Drilled and Threaded for 1/8" Pipe.
These Holes may be milled to Slots on Valve face.
Cross Section of Cylinder Showing Steam Passages.
A Shoulder may be turned on the Standard as indicated by the Dotted Lines.
40T.P.I.
24T.P.I.

The writer used a lathe. The base (Fig. 1) was surfaced by mounting it in the lathe and facing the bottom until it was smooth and all the pittings in the casting and high spots had been removed. Next the ends were finished and then the bearing surface. When the base is finished it should be touched up with a fine file, such as smooth or dead smooth with a single or double cut. If one has a shaper or a planer it is easy enough to surface the casting.

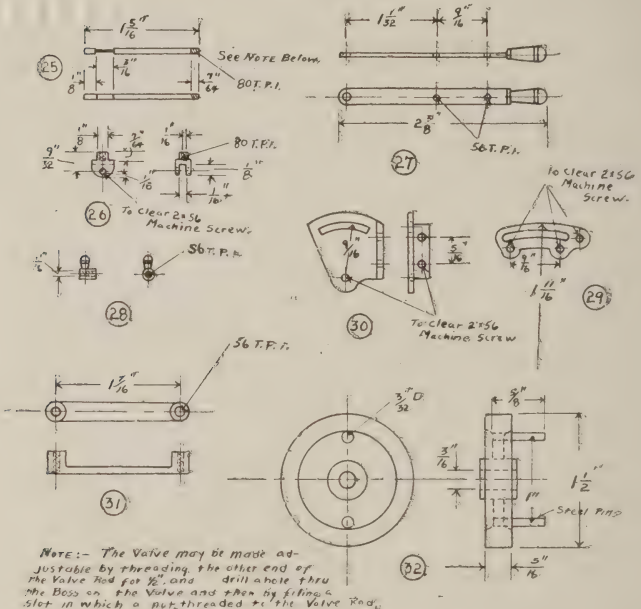
If the third method is used, namely with a vise and files, the base should be placed in the vise and gone all over with a second cut file. The work must be done very slowly and accurately that when the two ends are tested for being parallel to each other and perpendicular to the base they will be true in every respect.

After one of the three above methods has been followed out the base should lightly be gone over with some fine emery cloth to remove all tool or file mark. The bearing caps can be finished by filing, and polished with emery. Care has to be taken in seeing that when they fit to the base they have perfectly true surfaces. Each cap should now be marked and a corresponding mark made on the base.

The caps are clamped in place and the bolt holes drilled for a 2 x 56 ¼" brass or steel machine screw. The holes should be drilled at least 3/32" below the required depth. For this work a No. 51 drill is needed. After the holes are drilled, the caps are taken off and a No. 44 drill is passed through the holes drilled in the caps. This enlarges the cap holes for the bolt to pass through without injury to the threads.

A 2 x 56 tap is used to thread the holes drilled in the base. A certain amount of care must be taken in handling these taps. After a thread has been started the tap is screwed in a certain amount and then backed out to clear it of any chips. When a tap clogs there is a tendency to break it. The tap should not be forced in when it reaches the bottom because it may jam, and an extra twist will break it. All burring at the holes are removed with a file.

The next step is to drill the shaft bearings. This is accomplished in the following manner: The bearing caps are screwed tightly in place, and the vertical center line is located on one end. The same center line is then located on the other end and the two carefully checked to see if they coincide, and if they do a center mark is lightly punched where the vertical center lines intersect with the line which splits the bearings. The base is clamped down with one end resting squarely on the surface of the drill press table. The diameter of the shaft hole is $\frac{3}{16}$", but it is better to use a smaller drill first, such as $\frac{1}{16}$" and drill a guide hold through both of the bearings Next the 11/64" drill is run through the hole. The base is then clamped in the vise and a $\frac{3}{16}$" hand reamer passed through the shaft holes. The reamer must be turned in the direction in which it is intended to cut and under no circumstance must it be backed out. Pass it completely through the work.



NOTE:- The Valve may be made adjustable by threading the other end of the Valve Rod for 5/16" and drill a hole thru the Boss on the Valve and then by filing a slot in which a nut, threaded to the Valve Rod, turns in.

This Engine may be made simple and non-reversing by omitting Item Numbers 27, 28, 29, 32, 33, 37, 38, 39, 40, 41, 42, 43 and 48.

← Material List →

NO.	Name.	No. Req.	Mark	Dimen.	Remarks.
1	Base	1	①		Casting
2	Bearing Cap Screw	4		2×56 3/16"	Steel or Brass.
3	Standards	4	③④⑤	③ 3/16" O.D. ④⑤ 1/4" O.D.	Drill Rod or Drill Rod and Brass Rod.
4	Crank Shaft	1	⑥	3/16" D.	Steel (Built Up).
5	Cylinder	1	②		Casting
6	Standard Nuts	4		5×40	A.S.M.E.
7	Cylinder Cover	1	⑦		Casting. Bolt Circle Diameter = 29/32"
8	Ditto Bolts	4		2×56 3/16"	Steel or Brass.
9	Bottom Cylinder Cover	1	⑨		Casting; (See Remarks from #7).
10	Ditto Bolts	4		2×56 3/16"	Steel or Brass
11	Gland	1	⑧	5/16" D	Hex. Brass Rod.
12	Crosshead Tunnel	1	⑫		Casting (see Remarks Item #7).

Before drilling the four standard holes, the cylinder casting has to be machined and cleaned up.

Oil holes $\frac{1}{16}$" in diameter should be drilled in the top of each bearing cap. The holes should be slightly counter sunk.

THE CYLINDER. The cylinder is the next problem and that is the one casting upon which one needs to do the most accurate work. The first step is to finish the top, bottom and valve face. (Fig. 2). The top and bottom must be absolutely parallel to each other and perdendicular to the valve face. The machining is accomplished by one of the three methods described above. The layout and marking of the ports are discussed later.

A surface plate and surface gauge are needed. A good piece of plate glass, say 15" x 15" without any flaws makes an excellent surface plate. The surface gauge, a tool maker's preferred, can be procured from a good hardware or tool house. A try square is set on the plate and the surface gauge so adjusted that the point of the scribe is exactly $\frac{1}{2}$" above the surface of the plate. The cylinder casting is then placed with the bottom resting on the plate. With one hand, hold it down so that it cannot shift, and grasp the gauge by the base with the other hand. Slide the gauge back and forth, so that the scribe makes a faint scratch on the valve face exactly midway between the top and bottom.

As there are flanges on the bottom of the cylinder casting it must be levelled up with small strips of wood or metal so that the line just drawn is vertical to the plane of the surface plate. This can be ascertained by the use of the square. The surface gauge is readjusted so that it will scratch a line which will run at right angles to the first line. The valve face will be divided into four equal parts, $\frac{1}{2}$" square each way.

The bearing caps are removed from the base and the base and cylinder clamped together. The valve face of the cylinder should coincide with one end of the base, and the vertical line on the valve face should coincide with the vertical line scratched on the end of the base.

The four standard holes are drilled. In this case the thread is a No. 5 x 40. The tapping drill is a No. 38 drill. When the four holes are so drilled, the cylinder is unclamped from the base, and a 5 x 40 tap is used in threading the four holes in the base. The four holes in the bottom of the cylinder are enlarged by a No. 32 drill.

The cylinder is ready to be bored. The diameter of the bore is $\frac{5}{8}$". This can be done in a drill press or a lathe. When it is three or four thousandths of an inch under $\frac{5}{8}$" diameter, a $\frac{5}{8}$" hand reamer is used in a manner similar to that described in reaming the shaft holes in the base. It would be better to buy an adjustable hand reamer if one can afford it as these reamers are capable of being adjusted several thousandths of an inch above or below the size wanted. They are rather hard to adjust as they have to be set by a micrometer.

13	Piston	1	(10)		Casting.
14	Ditto Rod	1	(11)	1/8" D.	Drill Rod.
15	Crosshead	1	(12)		Casting
16	Connecting Rod	1	(14)		Casting
17	Ditto Bearing Bolts	2		2x56 9/16"	Steel or Brass
18	Ditto Nuts	2		2x56	A.S.M.E.
19	Steam Chest	1	(21)		Casting
20	Ditto Cover	1	(24)		Casting
21	Ditto Bolts	4		2x56 3/4"	Steel or Brass
22	Slide Valve	1	(25)		Casting.
23	Wrist Pin	1	(16)		Steel
24	Ditto Washer	1	(17)		Steel
25	Slide Valve Rod	1	(26)	1/16" D	Drill Rod.
26	Ditto Yoke	1	(28)		Brass.
27	Link	1	(29)		Casting
28	Ditto Bolts	2		2x56 1/4"	Steel or Brass.
29	Ditto Nuts	2		2x56	A.S.M.E.
30	Forward Eccentric	1	(19)		Casting
31	Ditto Set Screw	1		2x56 1/8"	Brass or Steel
32	Backward Eccentric	1	(18)		Casting
33	Ditto Set Screw	1		2x56 7/32"	Headless. Steel or Brass
34	Eccentric Rod	2	(20)		Casting
35	Ditto Bolts	4		2x56 1/2"	Steel or Brass
36	Ditto Nuts	4		2x56	A.S.M.E.
37	Reverse Lever Bracket	1	(30)		Casting
38	Ditto Screws	2		2x56 3/16"	Steel or Brass
39	Reverse Lever	1	(27)		Casting
40	Ditto Lock Nut	1	(23)		Brass Rod.
41	Ditto Screw	1		2x56 1/8"	Steel or Brass
42	Swinging Link	1	(31)		Casting
43	Ditto Screws	2		2x56 1/4"	Steel or Brass
44	Yoke Pin	1		2x56 5/16"	Steel or Brass
45	Ditto Nut	1		2x56	A.S.M.E.
46	Flywheel	1	(32)		Casting
47	Gland for S. Chest	1	(22)	1/4" D	Hex. Brass Rod.
48	Rev. Lever Pin	1		2x56 5/32"	Steel or Brass

NOTE:—

1. All bolts, screws and nuts are A.S.M.E. Standards 0x80, 2x56, 5x40, 10x30 and 12x24

2. All bolt holes in Marks 7, 9, 13, 21, 24, 27, 29, 30, 19, 20 are understood to pass a 2x56 Machine Screw UNLESS they are Threaded, Marked, or otherwise Designated.

3. All Drawings are approximately full size.

We can supply three large sheets of blue prints which include all the details for this engine.

PRICE $2.10 per registered mail.

Scratch a mark exactly 11/64" from the center on the vertical line, both above and below the center line on the valve face and with the center punch make a slight mark. These marks locate the centers of the two steam ports. Place the casting valve face up, and drill a 5/64" hole upon the two centers, first located, to a depth of not more than 9/32". It would be better if the hole was not drilled deeper than ¼".

The exhaust port is located where the two perpendicular lines on the valve face cross each other. Drill to the depth of 3/16" with a 3/32" drill. The casting is unclamped and turned to an upright position. A 5/64" hole is carefully drilled 13/32" from the valve face until it strikes the upper steam passage. It is better to drill this hole slowly than to go by the steam port and find yourself in the exhaust port. The casting is reversed and the other steam passage is drilled. The cylinder casting is then clamped by the top and bottom. A ⅛" hole is located ½" from the top and bottom and 3/16" from the valve face on one side. This hole forms the exhaust port. It is carefully drilled to the depth of 3/16". If the drilling is accurately done, this hole should meet the center hole. The method of drilling the cylinder cover bolt holes will be explained later.

The holes just drilled on the valve face may be milled out the same size in width as the diameter of the ports but ⅛" in length, thus making the steam ports ⅛" x 5/64" and the exhaust port ⅛" x ⅛".

STANDARDS. There are two methods of making the standards. (4 in number). The writer was forced to adopt the latter method because of an accident. If the second method is used, and one does careful work, it looks just as good as the first and it certainly is as strong.

In the first method, four pieces of 3/16" drill rod 3½" long are secured. On one end a shoulder is turned to ⅛" diameter and 10/32" long. On the other end a shoulder ⅛" diameter, 11/32" long. A 5 x 40 die is used right up to the shoulder on each end. The drill rod is then polished with fine emery cloth. (See Fig. 3). If desired, a shoulder may be turned on the standards, as indicated by the dotted line.

The second method is much simpler. Take four pieces of drill rod ⅛" diameter and thread one end to a depth of ½", using a 5 x 40 die. The other end is threaded to a depth of ⅜". A piece of brass tube ¼" outside diameter, ⅛" inside diameter is cut into four sections of 2 23/32" long. These tubes must be this exact length, because when supporting the cylinder, the cylinder must be true in every way to the base. All burring from sawing must be removed, as this will prevent the rod from slipping into the tube. In the event that it will not, rub the rods briskly with emery cloth and a little oil until the rods slide into the tube. When this is done, the tubes may be polished to remove all tool marks. (See Figs. 4 and 5).

(To be continued)

RADIO - FUNDAMENTALS

BEING PART II OF
WIRELESS TELEPHONE CONSTRUCTION

By NEWTON HARRISON

CHAPTER VI.

THE AUDION AND ITS USE. Detecting waves for radio-speech or music, is accomplished by means of a detector, that provides a path for a relay current. In other words, the lamp called the audion, Fig. 44, is sensitive to the waves transmitted from a distant station and is able to emphasize them. In this manner, if one audion amplifies the current, and it can be used to amplify the current in a second audion and a third, it is evident that the increased current will give a much louder, though not necessarily a much clearer sound in the receiver.

GETTING SOUND. To get a loud, clear sound, in the receiver, it is necessary to have not only enough current, but the overtones that make the sound clear. The waves are very weak and each receiving instrument gets but little energy. Fortunately, the receiver, as already stated, takes an infinitesimal current, and for this reason, it is possible, by means of the audion to augment the effect and produce the desired sound.

USE OF ELECTRONS. The audion does this, by using the corpuscles of electricity that fly from the hot filament, outward, to a metal plate, Fig. 45. The audion consists of three parts: First, an ordinary lamp filament. Second, a grid of metal near the filament. Third, a metal shield or plate near the grid. These three things are employed in an exhausted glass globe to augment speech.

THE FLEMING TUBE. The audion is a development of the Fleming tube, and this in turn, is the result of a discovery by Edison, that a delicate current actually passed between a filament in a lighted lamp and a plate near it within the lamp globe Marconi engaged Fleming as his engineer and the Fleming detecting tube, Fig. 46, resulted for wireless telegraphic purposes. But it was built without the grid employed by De Forest. The grid is the supersensitive part of the tube or audion. It receives the waves, or their equivalent in electricity, and super imposes them upon the electrons passing between the hot filament of the lamp and the plates connected to the receiving part of the tube. Consequently, when the lamp is lit, and the electrons are passing in a uniform stream,

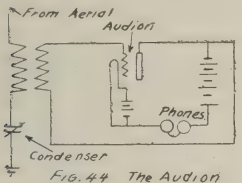
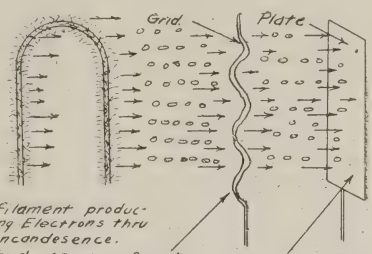


FIG. 44 The Audion or Detector Tube in Service.



Filament producing Electrons thru Incandescence.
Grid affecting Sensitiveness of Plate and Phones.
Plate acting as Target for the Electrons from Filament.

FIG 45. Electrons discharged from Filament passing across Grid to Phones

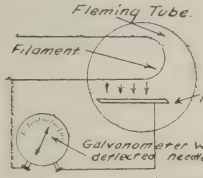


FIG 46. Principles of the Fleming Detecting Tube.

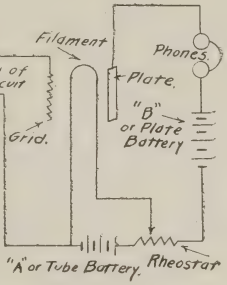


FIG 47. Method of Connecting Plate to "B" Battery and Phones, and Filament To "A" Battery

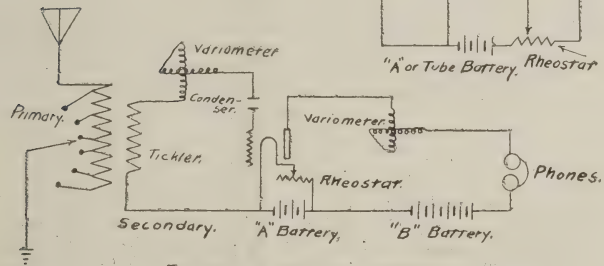
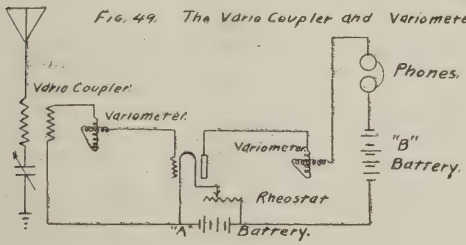


FIG. 48. A Standard Armstrong Circuit.

FIG. 49. The Vario Coupler and Variometer in Service.



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the various changes in the grid, due to the waves, acts upon this flow of electrons, varying it and recording these changes as sound in the receivers attached to the circuit.

HOW THE AUDION ACTS. In other words, the audion turns the waves received into sound, by means of the telephone receivers. The battery connected to the audion-plate, Fig. 47, emphasizes the flow of energy between the lamp filament and the plate. By this means, the telephones are able to obtain more power for their operation. To get loud sounds in the telephone, the original waves received must be amplified. To do this in a modern way, the energy received from the waves may be sent into one, two, three or more amplifying tubes. Each one adds energy and increases the audibility of the message

TUNING THE STATION. The circuit receiving the wave must be in tune with the one transmitting it. In order to attain this end, the means employed are inductance and capacity. The general plan followed is that of using certain devices to feed back and further this purpose. One is called the vario-coupler, another the variometer, and still another, the variable condenser. These devices, Fig. 48, assist in producing a resonant circuit. A circuit in resonance with another, is one in which the waves sent out produce the greatest current in the one receiving it. Therefore, it is a matter of efficiency to have real resonance between circuits, otherwise the wave received will not actuate the circuit it enters or affects to the required degree. The variometer, the vario-coupler, the adjustable inductance and the adjustable condenser are merely means of securing in the circuit a free flow of electricity, not otherwise attainable, unless the adjustment of these electrical values is properly secured. To electrical experts, the fact that one current is tuned to another, merely implies the establishing of a relationship between resistance, self induction (coils) and capacity (condensers) which is the fundamental basis of resonance. A plan followed out is that of connecting the aerial to a vario-coupler, the other end of the vario-coupler to an adjustable condenser and the other pole of the condenser to the ground. This places in the receiving aerial, an inductance and capacity, which can be varied in value until the circuit is tuned to the wave.

THE VARIO-COUPLER. The vario-coupler consists of two coils, a primary and a secondary. One coil is connected to the aerial at one end, and to the condenser at the other end and then to the ground. This gives the aerial a chance to tune in with the transmitted waves and produce a maximum flow of electricity by adjusting them both. The other coil of the vario-coupler is connected to a dry-battery of 22½ audion bulb. From the audion bulb, another connection goes volts in this case, a variometer and then to the plate of the audion bulb. From the audion bulb, another connection goes out from the grid to the variometer and from the variometer back to the other terminal of the vario-coupler,

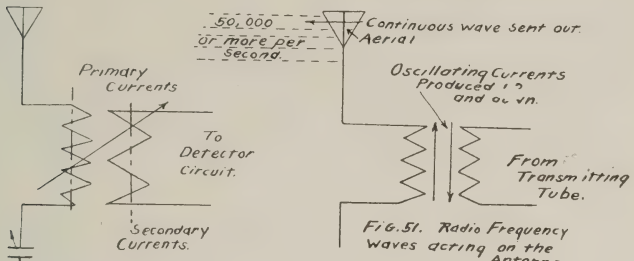

FIG 50. Transfer of energy from Aerial to the Detector Circuit by Mutual Inductance.

FIG. 51. Radio Frequency Waves acting on the Antenna.

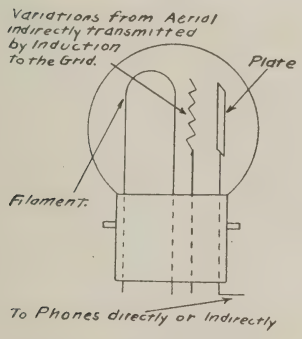

FIG. 52 The heart of the System is the Grid in Action.

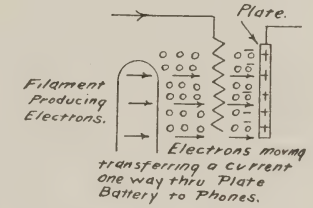

FIG 53. Negative Electricity from filament to Positive Plate altered by the Positive or Negative coming to the Grid.

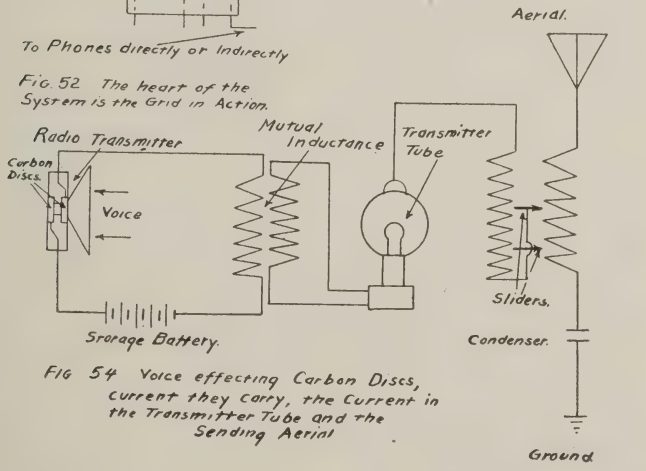

FIG 54 Voice effecting Carbon Discs, current they carry, the Current in the Transmitter Tube and the Sending Aerial

(To be continued)

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New York model railway enthusiasts will be interested to learn that the New York Central Railroad has decided to form a semi-permanent exhibit of the historical locomotive De Witt Clinton and cars, and the railway models and appliances which were displayed on the Service-Progress Special Train.

Included in the models are the wonderful historical locomotive models made by Ernest Warther of Dover, Ohio, also the 1¾ inch gauge model electric locomotive and ten freight cars shown by Arthur W. Line, of Dunkirk, N. Y.

The exhibit will be located on the east balcony of the Grand Central Terminal, New York City, and will be displayed for six months, January to June, inclusive, 1924.

By actual count over 800,000 persons passed through the Service-Progress Special and viewed the numerous models and other exhibits during the 5 months tour of 11,000 miles. The decision to continue to show these interesting transportation exhibits is a happy one and many thousands who were unable to visit the train will now have ample opportunity to examine the interesting exhibits at leisure.

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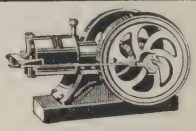

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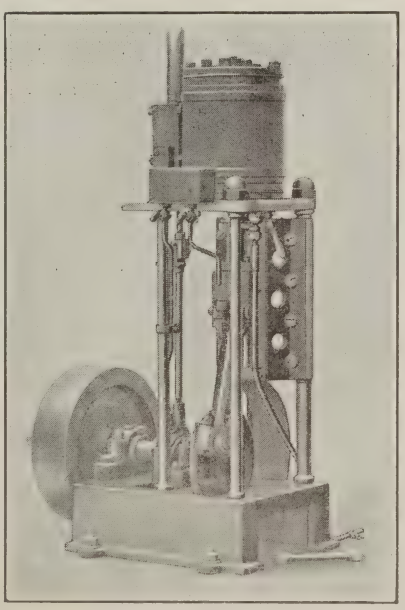

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OUR FOREWORD

The construction of Model Locomotives is a very fascinating pastime, in fact it is more than a pastime. It is the Science of Engineering in miniature as it includes all the essential features of its larger prototype.

The writer has frequently conversed with ambitious amateurs who have expressed a desire to build a Model Locomotive and going into the question more fully has ascertained that they have not grasped the vastness nor understood the difficulties of such an undertaking. He will endeavor briefly to outline some of those difficulties.

Firstly comes the selection of a type or particular design. This is a little difficult as there are hundreds which may be classified roughly under the following headings.

1. Ordinary types of steam locomotives, including tanks, freight, passenger.
2. Compound locomotives.
3. Steam-turbo electric locomotives.
4. Internal combustion locomotives, including Diesel type.
5. Internal combustion electric locomotives.
6. Electric locomotives.
7. Compressed-air locomotives.
8. Clockwork locomotives.
9. Other special types of locomotives.

The next questions to consider would be the scale and the gauge.

The drafting of a complete set of working drawings and list of materials.

The making of a set of patterns for all the parts that would have to be cast.

The machining of the castings, boring the cylinders, steam chests; finishing the slide valves, cranks, link motion, pistons and connecting rods; turning and mounting wheels; construction of the frame fire box, boiler, cab, tender, and the small fittings; assembling of the parts; adjustment of the valves and eccentrics.

The method adopted for raising steam, i.e., alcohol lamp, blow torch or solid fuel.

The final testing under steam.

Some of this labor could be avoided provided the Modelmaker obtained a set of drawings and castings from England where many different types are for sale. These of course would be of English design.

We do not know of any sets of American types that can be purchased in the U. S. but we hope there will be some soon.

The apparatus required would be—an accurate lathe and good set of tools and gauges.

A certain amount of mechanical skill would be required coupled with infinite patience and perseverance.

One of our readers has just completed a fine set of scale drawings to detail for a model of a Modern American Locomotive. The set consists of 52 sheets. The calculations and work on this set occupied his leisure time for nearly one year.

If there are any of our readers who have already built an American Locomotive and can supply sets of drawings and castings we shall be very glad to hear from them.

THE CONSTRUCTION OF MODEL
MARINE STEAM ENGINES

By F. DRAYTON GRIMKE

A SINGLE CYLINDER DOUBLE-ACTING ENGINE, WITH REVERSING GEAR (5/8" BORE X 5/8" STROKE)

CHAPTER II.

CRANKSHAFT. Two pieces of cold rolled steel 5/8" long x 1/4" high x 5/16" wide obtained from a larger piece of stock, are cut and finished to size. The sides must be true to each other when finished. These pieces, or webs as they are better known, are clamped together so they will make a block 5/8" long x 1/2" high x 5/16" wide and placed in the drill press vise. The throw of the crank is 5/16". A center is located near one end (Fig. 6) and a 3/16" hole drilled through both webs. This being done a piece of 3/16" drill rod 1/2" long is forced through the hole. The clamps may be safely removed. The blocks should be tested to see if they line up and the second 3/16" hole drilled, the center of which is 5/16" from the center of the first.

The short piece of drill rod is knocked out. A piece of drill rod 3/16" diameter x 25/32" long is forced through the same pair of holes, and the webs are moved apart until there is a space of 9/32" between the two inside surfaces. A piece of drill rod 2 7/16" long, 3/16" diameter, is forced through the remaining pair of holes. Two pieces of rod will lie between the webs which should be tested to see if they are 9/32" apart. The long piece of rod should project 5/16" from one end.

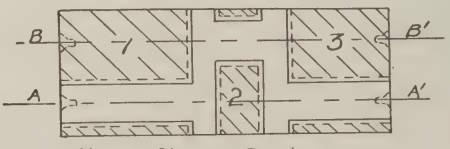
Four holes 1/16" diameter are drilled directly through the webs and 3/16" rod. Four short pieces of 1/16" drill rod are forced through these holes until they become flush with the other surface. These pieces serve as pins to prevent the 3/16" drill rods or the webs from shifting. With a hacksaw cut away the section of the 2 7/16" rod which lies between the webs (Fig. 6) and smooth away with a file all rough ends. The crank shaft is inserted into the bearings and the caps screwed down. If all the work has been properly done, the shaft should turn freely in its bearings, but the chances are that the bearings will need to be scraped. The method of scraping is described in the assembly of the engine.

The alternate method of building the crankshaft is similar to that of making a forged crankshaft. A block of cold rolled steel 2 5/8" long x 5/8" wide x 1/4" thick is procured. It is cleaned up with a fine file so that any scribe marks made on

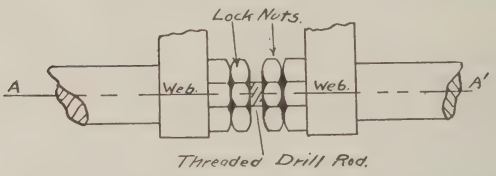
it may be easily seen. The crankshaft is marked out, and all center lines produced and checked up to see if they coincide with each other on all faces of the block. When the crankshaft is so marked, it is better to leave an allowance of 3/32" of an inch all around for machining. The block should look like the sketch attached before cutting.

On the end of the block, locate the shaft centers AA' from these centers locate another set 5/16" away from the first, or the distance between A and B or A' and B'. The line BB' should coincide with the crank center line. Center punch the four centers and counter sink them with a combined drill and counter sink.

Carefully cut away the shaded portion marked 2 and chuck the piece in the lathe between centers BB'. Turn the crank to $\frac{5}{16}$" diameter exact, the inside faces and ends of the web to size.



NOTE: Shaded Portions are cut away (See Text)



When this is done, take the piece out of the lathe and cut away the shaded portion marked 1 and 3. The crankshaft is now ready to be finished. Before it is chucked, a thrust rod must be inserted between the webs so as not to distort the crank. It is done in this way.

Take a $\frac{1}{8}$" piece of drill rod just long enough to slip in between the webs. Thread it and get four nuts of the corresponding thread. Insert the rod with the four nuts between the webs exactly along the center line AA'. Turn the outside nuts until the drill rod remains in place. Carefully turn the nuts out until there is a good grip. The two inside nuts are used as lock nuts and they can be clamped down as tight as they can go. (See sketch attached). If the thrust rod exerts too much pressure there will be a tendency to throw the shaft out of alignment and bend the webs out, thus making the crank part of an arc of a circle.

Finish the crank by using the centers AA'. Turn the shaft

to 1/16" diameter. The outside surface of the webs are afterwards finished.

CYLINDER COVERS. TOP COVER. The top cover is a simple turning operation. The outside diameter is turned to 1" exact (Fig. 7). A shoulder is turned to 5/8" diameter or 0.625" and 1/16" thick on the inside surface of the cover. With emery cloth take the shoulder down until it fits the bore with a good sliding fit. There must be no side play, that is, the cover when placed in correct position, must not have any motion if shoved from one side to the other. The outside surface of the cover is finished off by gripping the shoulder of the cover in the chuck and turning it until the surface is smooth. The cover is polished with emery.

With a radius of 27/64" scribe a circle on the 1/16" flange and divide the circumference into four parts. These four points will be the center for the cylinder cover bolt holes. Clamp the cover to the cylinder and drill the four holes, using a No. 51 drill, to the depth of 1/8" in the cylinder. The cover is removed and the 2 x 56 tap used to thread the bolt holes in the cylinder. The four holes in the cap are drilled oversize to pass a 2 x 56 machine screw.

The small amount of metal between the bore and the port is chipped away where the steam port comes to top of the cylinder. This channel is cut to a depth of 3/32" below the surface, and when looking at it from inside, the bore will look like a V.

BOTTOM COVER. The bottom cover is a little more complicated, inasmuch as the stuffing box is included in this piece. The bottom cylinder cover bolt holes are drilled and the bottom cylinder cover is machined in a similar manner as the top cylinder cover. Instead of the cover being flush on the outside, there is a projection of 1/16". This projection is turned down until it is one or two thousandths of an inch below 1/2" in diameter, and the end faced off. While the cover is still chucked, drill a hole 1/4" deep and 0.177" diameter, which is the same diameter as a No. 16 drill. Thread it by using a 12 x 24 tap. (Fig. 9).

The gland is made from a 5/16" hexagonal brass rod 1/2" long. The rod is clamped in the lathe and a shoulder turned to 0.216" diameter x 3/8" long. Thread this shoulder with a 12 x 24 die. Cut off the threaded portion not needed with a hacksaw, thus making the total length of the gland 5/16". (Fig. 8). Smooth off the cut end with a file, screw the gland into the stuffing box as far as it will go and rechuck the cover in the lathe. Through the center, drill a 1/8" hole for the entire length of the cover and gland. The piston rod passes through this hole. Now this hole may be finished in one or two ways. Reaming or lapping. The second method is just as good.

The cover is still chucked. A piece of drill rod 1/8" diameter x 1" long is placed in the drill chuck attached to the tail stock. Taper the rod slightly for the first 1/4" and charge it with powdered emery and oil. Start the lathe, and gradually

feed the drill rod through the gland and cylinder cover. This will make a nice sliding fit, neither too tight nor too loose for the piston rod. Cut the V slot above mentioned on the opposite end of the cylinder. The bolt holes are drilled in the same manner as the holes in the top cylinder cover. A 5/16" hole is drilled in each hexagonal face to facilitate tightening the stuffing box with a pin wrench.

PISTON AND PISTON ROD. The piston rod is made from a 1/8" diameter drill rod, 1 3/16" long, threaded with a 5 x 40 die to a depth of 1/4" on one end and to a depth of 9/64" on the other.

The piston casting (Fig. 10) is chucked and turned to 5/8" diameter. A groove 3/16" wide and 1/8" deep is then cut in it. A 1/8" hole is drilled through the center and threaded with a 5 x 40 tap.

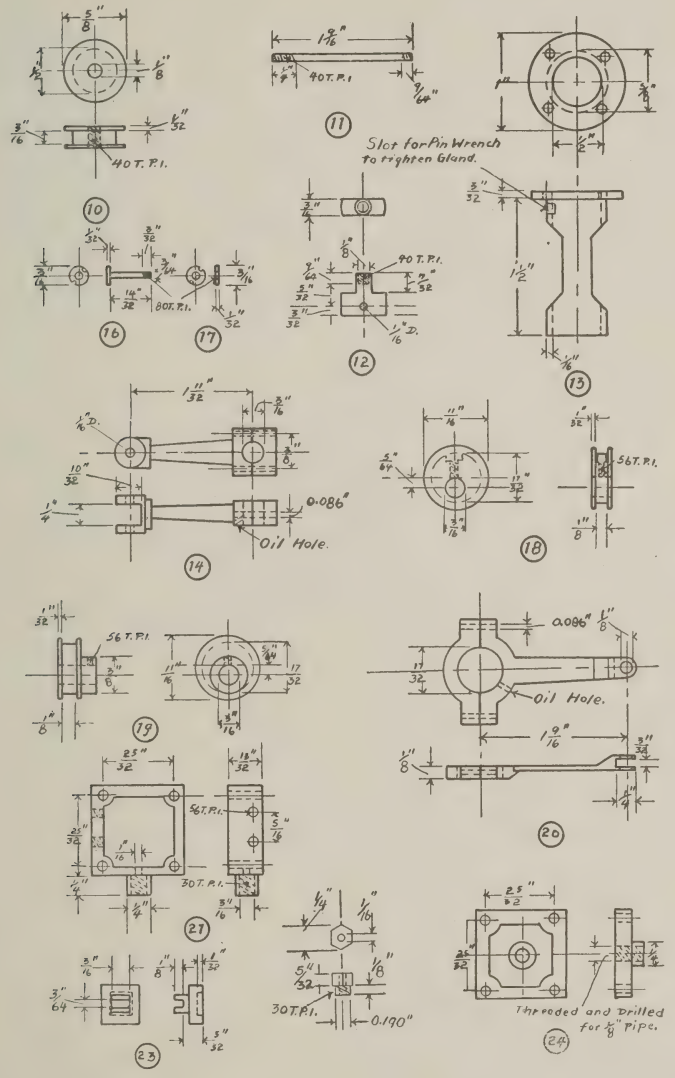
The piston rod (Fig. 11) is screwed into the piston. If the rod projects above the surface of the piston, remove the excess rod by filing or grinding.

CROSS HEAD TUNNEL. The casting of the cross head tunnel (Fig. 13) is chucked and the flange turned to an outside diameter of 1" and faced off. The tunnel is rechucked with the face of the flange flat against the chuck face and the jaws tightened after the tunnel runs true. The tunnel is either bored or drilled 1/2" diameter its entire length and afterwards reamed to 1/2" exact. When this is done it is turned all over in the lathe and afterwards polished with emery.

The bottom cylinder cover and stuffing box should fit nicely in the tunnel. If it does not, a little judicious filing will help matters. The sides of the tunnel, it will be noted, are cut away and it is an important point to note that the sides cut away should face the valve face and the rounded end of the cylinder. The uncut portion acts as guides for the cross head. When the cross head has been so adjusted to the bottom cylinder cover they may be clamped together and held in the drill press. With a No. 44 drill and using the four holes in the cylinder cover as guide holes, run the drill through the cover and through the flange of the tunnel. This is done to align the bolt holes. All burring is removed with a file before assembly.

CROSS HEAD AND WRIST PIN. The cross head (Fig. 12) is machined with a diameter of 1/2" so it can slide back and forth in the tunnel. There should be no loose play but not so tight that it will bind. The shoulder on the cross head is turned to 3/16" diameter, and a 1/8" hole is drilled to the depth of 9/64" and tapped with a 5 x 40 tap. The wrist pin hole is drilled 12/32" from the top of the shoulder. A 1/16" hole will do very nicely. The cross head is then finished with filing and emery.

The wrist pin (Fig. 16) is turned from 3/16" drill rod to a diameter 3/64" and 14/32" long. A flange 3/16" diameter and 1/32" thick is left on one end. The 3/64" diameter portion is threaded with a 0 x 80 die to the depth of 3/32". A washer is then made 3/16" diameter x 1/32" thick with a 3/64" hole


40 T. P. I.
(11)
Slot for Pin Wrench to tighten Gland.
(10)
80T. P. I.
(16)
(17)
90 T. P. I.
(12)
(13)
(14)
0.086"
Oil Hole.
(18)
56 T. P. I.
(19)
Oil Hole.
(20)
30 T. P. I.
(21)
0.190"
(23)
Threaded and Drilled for 1/8" Pipe.
(24)

and tapped for 80 threads per inch. This washer (Fig. 17) holds the wrist pin in place when all is assembled.

Two nicks diametrically opposite each other should be made in both the wrist pin and washer, to serve as a means to tighten the washer. A special spanner or wrench is made by two steel prongs set in a small piece of iron or steel the right distance apart to it in the grooves or nicks.

CONNECTING ROD. The main bearing of the connecting rod (Fig. 14) is the first part to tackle. The four faces must be absolutely true in every respect. Two holes, 3/8" apart, are drilled for the 2 x 56 clamping bolts. The bearing is carefully split with a fine bladed hacksaw and the two pieces so marked that they go back together the same way. The split surface is carefully trued up with a fine file so that when the halves fit together there will be a perfect fit. The halves are rebolted together very tightly and the faces gone over until the line of separation becomes very faint. The center of the crank pin hole is accurately located on the big end and from that point the wrist pin center is located 1 11/32" from the main bearing center. The 3/16" hole and the 1/16" holes are drilled, the 3/16" is then reamed.

The slot in which the cross head cradles in the small end is carefully sawed and filed to shape. Don't enlarge this slot more than is absolutely necessary but see that the cross head fits properly into place, that the wrist pin holes properly line up, and that the cross head will not bind when the connecting rod is at its greatest amount of angularity.

A 1/16" diameter oil hole should be drilled to lubricate the crank pin and connecting rod bearing.

The conecting rod can now be finished by the usual method.

ECCENTRIC. The two eccentrics (Figs. 18, 19) are cast together and are machined all over, after which the slot 1/8" wide x 5/64" deep is cut in each eccentric. The clamping bolt holes are drilled and tapped for a 2 x 56 set screw. The hole in the back eccentric is enlarged to 7/64" diameter x 1/16" deep for the small grub screw head which clamps the eccentric to the shaft. A hole 3/16" diameter is drilled 5/64" off the center of the eccentric and the eccentrics are mounted on a 3/16" mandrel in a lathe, and the collar is turned on the forward eccentric to 3/8" diameter. When this is done the eccentrics are carefully plit apart, and the sides are slowly reduced to 1/32" in thickness.

If the engine is non-reversing the eccentric with the collar on it is the only eccentric used.

ECCENTRIC RODS. The eccentric rods (Fig. 20) are finished in the same manner as the connecting rod, except that the yoke pin hole just clears a 2 x 56 bolt. In the non-reversing engine only one eccentric rod is necessary.

VALVE CHEST. The valve chest (Fig. 21) is machined by either filing or planing in a shaper or lathe until it is 1" x 1" x 13/32" thick. The four bolt holes are located 25/32" apart and the valve chest clamped to the valve face of the

cylinder. After the four holes are drilled for 2 x 56 bolts, and are afterwards enlarged to pass a 2 x 56 machine screw. The shoulder for the stuffing box is turned ¼" diameter and ¼" long. A No. 22 drill is used to drill a hole to the depth of ¼". This hole is threaded in the usual manner with a 10 x 30 tap.

The gland (Fig. 22) is made from a ¼" hexagonal brass rod and a shoulder is turned to 0.190" diameter. The gland is threaded with a die corresponding to the tap first used. When the gland is threaded, it is screwed in place and a $\frac{1}{16}$" hole for the valve rod is drilled and lapped in the same manner as described in the case of the piston gland.

If the reversing gear is used two holes are drilled and tapped for a 2 x 56 machine screw $\frac{5}{16}$" apart and 3/32" from the outside face of the valve chest. These holes are used to mount the reverse lever bracket. The valve chest is finished in the usual manner.

VALVE CHEST COVER. The valve chest cover (Fig. 24) can be finished by either turning in a lathe or by filing. It is best to turn in the lathe as the inside surface has to be dead true to make a good steam tight fit. The cover is gripped in the chuck by the small spigot on the casting and the face turned dead true. All tool marks are afterwards removed by a file. The outside edges are finished off and all casting marks and pittings removed. The cover is then clamped to the valve chest and the four bolt holes drilled. The hole for the steam pipe is drilled and threaded for a ⅛" pipe.

VALVE AND VALVE ROD. The face of the valve (Fig. 23) is filed or planed off to remove all pittings, etc., and finished with emery. The face is then rubbed to a dead true surface by charging the surface plate with emery powder and oil. It is rubbed until the face, when smeared lightly with thin oil, sticks to the plate. A slot is cut in top 3/64" wide x ⅛" deep. The top on the valve should not be any longer than $\frac{3}{16}$".

The valve rod (Fig. 25) is made from a piece of $\frac{1}{16}$" diameter drill rod 1 11/32" long. One end is threaded to a depth of 3/32" by using a 0 x 80 die. At 1" from the threaded end, the rod is filed flat on both sides for a length of $\frac{3}{16}$". The web or flat place should be 3/64" wide, or filed just enough so that the valve rod just fits into the slot. There should be no play, and if there is, a new rod should be made. A Barrette smooth file is the best type fitted for this job.

The valve rod yoke (Fig. 26) can be made from an old piece of brass rod $\frac{5}{16}$" diameter x $\frac{5}{16}$" long. In one end, a hole is drilled to a depth of 7/64" and tapped with an 0 x 80 tap. The shoulder is turned down to ⅛" diameter x 3/32" long. The rod is removed and firmly clamped in the vise of the drill. A No. 44 drill is used to drill a hole 9/32" from the end of the shoulder. This hole is for the pin which holds the yoke to the link. At the end, opposite the shoulder, a slot is cut so that the link will slip in without binding, and to a sufficient depth that the hole in the yoke lines up with the slot in the link. The yoke may now be finished by filing.

(To be continued)

RADIO - FUNDAMENTALS

BEING PART II OF
WIRELESS TELEPHONE CONSTRUCTION

By NEWTON HARRISON

CHAPTER VI.

The vario-coupler thus appears once in this circuit, but the variometer appears twice. The schedule is as follows: Aerial, vario-coupler, condenser and ground. This tunes the main receiving circuit, Fig. 49, permitting the auxiliaries to it to operate at their best in producing telephonic sound.

THE VARIOMETER. The variometer appears twice in this circuit, that is to say, the receiving or hearing circuit. The schedule is as follows: From the other coil of the vario-coupler to the many-celled dry battery, to a variometer, to the plate of the audion, from the grid of the audion to a variometer and then to the coil of the vario-coupler again. This circuit places the phones between the many-celled battery and the variometer. The augmented waves from the aerial appear in the vario-coupler as currents, due to the fact that while they pass through one coil of it, via the condenser, to the ground, they are augmented in the other coil of it, Fig. 50, and this, acting in conjunction with the variometer and the grid of the tube, in addition to the effect of the many celled battery and another variometer, gives volume to the telephone current and sound.

TRANSMITTING THE VOICE. To transmit the voice through space, the high frequency generator may be used, or an arc lamp, as on board certain naval vessels. But the vacuum tube, Fig. 51, is now in use for this purpose as well. The principle of it permits a current of a pulsating character to act on the aerial, producing waves of very high frequency. One way in which this is done is to have a storage battery supply power to a telephone transmitter, then to a transformer, a transmitting tube, an inductance and an aerial. Thus, the original power comes from a battery and enters a transmitter of the same general construction as those used in wire telephone circuits. The voice impresses the waves due to its variations upon the current in a transformer's primary. The secondary connects to the vacuum tube, which raises the frequency to 500,000 or more a second. This passes into the aerial and is dissipated in the form of waves of vocal form in the ether. Whatever wave is sent out, means an adjustment of the sending circuit to that particular wave. The inductance of one circuit and its capacity must be such with respect to

another circuit, that the product of them in one circuit must equal their product in the other. The fact that this is so will appear in the receiving circuit, in the way of enhanced effects. The crystal or tube generally used acts as a one way valve to the oscillations or waves. By impressing a high voltage upon the plate, the electrons passing from the filament are more readily affected by the charges in the grid.

The grid is merely a sensitive element, Fig. 52, that impresses the variations it receives in the form of currenst due to waves upon the electron flow across the plate. This, after all, is the heart of the system. The grid is in touch with the aerial and waves, and the plate with the telephone receivers. The two elements are the basis of clear, loud speech in the phones.

LENGTH OF WAVES. The fact that waves travel 300,000,000 meters a second, or 186,000 miles need not seem excessive, as the ether transmits all its disturbanes at this rate. This includes light, heat, magnetism, electricity and probably gravitation as well. In order to avoid confusion, the length of waves used for particular purposes is given in meters.

Wave Length in Meters	Frequency in Cylcles a Second	Type of Station
200	1,500,000	Amateur Stations
300	1,000,000	Ship "
360	834,000	Radio Telephone Broadcast Stations
450	667,000	Ship Stations
600	500,000	Commercial Ship and Shore Stations
1,000	300,000	U. S. Navy
1,400	214,300	Commercial Traffic
2,600	115,400	Time Signals
5,000	60,000	High Powered Commercial Stations
10,000	30,000	" "
15,000	20,000	" "
20,000	15,000	" "
30,000	10,000	" "

To calculate the length of waves or the number per second, the capacity, resistance and inductance of the circuit must be known, sending and receiving the oscillations.

TUBE TRANSMITTING. The creation of uniform wave trains, is accomplished by means of the audion used as a transmitter instead of a detector. As a detector it acts as a one way valve to the oscillations. By this is meant, that only one-half of the cycle can pass. Whether a crystal or tube is use, Fig. 53, this is still true. Consequently, as a transmitter, it creates a series of one-direction impulses, the other half being lost, and this may act as an interrupter without any visible mechanism, capable of sending out hundreds of thousands of waves a second. Electric waves vary in number and length,

the number per second ranging from millions downward to tens of thousands a second. There are two types in use in radio-telephony.

The first in use is the uniform wave, or blackboard, as it may be called, upon which the spoken wave is written. In previous chapters, the arc lamp was described as employed to develop uniform waves of high frequency, but since that time the De Forest tube has become an essential part of the system and now supplants the arc lamp in the average case.

The uniform wave sent out by the tube has impressed upon it the wave-equivalent of the voice, so that in reality two sets of waves are travelling to the receiving station; the radio wave sent out originally and continuously, and the audio-wave impressed on it by means of the telephone transmitter used at the sending end. Tuning must be done therefore, to take care of the constant wave and that due to speech.

THE TRANSMITTING STATION, is one equipped with a tube, a telephone transmitter and an aerial. The tube produces a uniform flow of electrons between its filament and its plate. The continuity here is of the nature of a pulsation. The transmitter telephone is one carrying a continuous current, whose variations in strength, due to the voice acting on the carbon disk, create the changes, Fig. 54, in the waves producing speech. But these waves are all etheric and must be transformed into equivalent currents at the receiving end. The waves radiating into space, are therefore of two distinct types: Those produced by a very high frequency ripple and those produced by the voice or audio wave superposed on the other wave. There are therefore two functions to be performed by the receiving set: that of properly receiving the main high-frequency wave and that of getting clear speech from the wave superposed upon it. The general tuning accomplishes this by means of inductance and capacity adjustments. The currents resulting from the waves are very faint and must be used as a foundation on which to build the audible sound. The waves sent out by the distant transmitter are electro-static and electro-magnetic. Whenever an electric charge is moved or caused to oscillate, it sends out waves of greater or lesser length. The greater length of waves is due to the lesser number of the oscillations. The lesser length of waves is due to the greater number of the oscillations. It is evident, that in a circuit having little to obstruct the free movement of a charge, that charge will oscillate the fastest and therefore send out the shortest waves. This is true in a circuit having little resistance, self induction or inductance and capacity. Consequently, as the aerial is the part ultimately acting as the final circuit, it is evident, that it does not pay to have it possess any qualities that would detract from its efficient action. In other words, the receiving aerial must be designed and built to produce from the waves received, as full and strong oscillating currents as are possible.

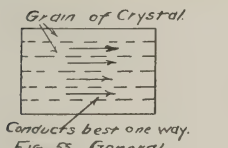


Fig. 55. General Dunwoody's discovery that Crystals Conduct best in one direction.

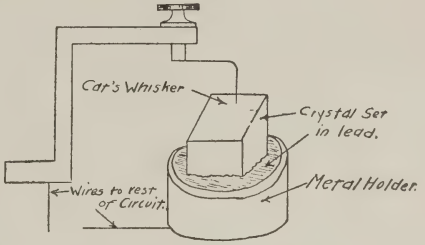


Fig. 56 Crystal, set in a Cup and lead with Cat's Whisker touching, acting as a derector.

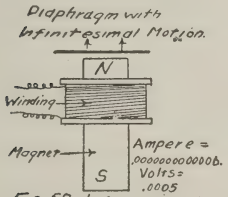


Fig. 58. Infinitesimal amount of energy consumed by a telephone Receiver.

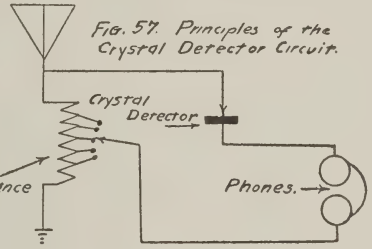
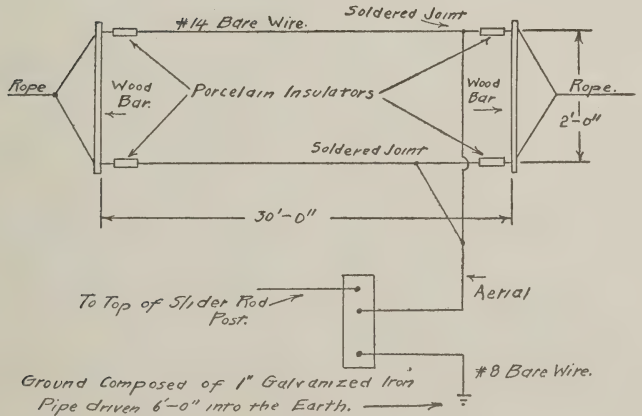


Fig. 57. Principles of the Crystal Detector Circuit.

Fig 59A. Aerial ' Derails.



(To be continued)

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To cover the cost of time, paper and postage, we make a charge of twenty-five cents for answering letters. Kindly enclose that amount and address your communications to Mr. F. D. Grimke, c/o Spon & Chamberlain, 120 Liberty St., New York. Letters that are of sufficient general interest will be published in this column.

F. J. S., Kansas.—1. Yes, Windmills are very economical. 2. Powell's Windmills and Windmotors contains directions and detail drawings for the construction of several sizes. The largest windmill has a wheel 10 ft. in diameter. There is also a chapter on the production of electricity by wind power. Price 75 cts.

T. M., Cincinnati.—We have not any blue prints of Model Power Flying Machines but you will find many articles on this subject in the Model Engineer. Your Public Library has a complete set.

NEWS ITEMS

There has recently been placed on the market a small sized Electric Soldering Iron. A very practical and exceedingly useful tool.

Our Radio Fans will be interested to hear that the new Wireless Receiving Set "Radiola III", put out by The Radio Corporation of America, is now for sale. This set is without doubt the best that has ever been put on the market, very neat and compact, easy to work, reliable and clear of tone. Complete with two tubes and pair of head phones, $35.00, expressage additional. Should any of our Readers not in easy touch with a Big Centre wish to purchase one of the "Radiola III" sets we shall be glad to act for them and upon receipt of their order with remittance will at once place their order with one of the authorized Distributors for immediate shipment.

Our Annual Stocktaking revealed the fact that we still have some complete Volumes of The Model Engineer in numbers and are offering them at a special price while they last. Each volume is perfect (see adv. column).

As soon as the frost is out of the ground many people will be turning their thoughts to that "little house" they intend to build. If you have not quite decided on the plans, "Ideal Homes" contains quite a variety of delightful small homes, showing a plan with description and a picture of each home printed in colors.

We have frequently had inquiries for blue prints of the lines and rigging of old ships. All who are interested in this work should get in touch with Mr. G. B. Douglas, 165 Summit Ave., Upper Montclair, N. J.

The issues of The Model Engineer for the months of January and February contain much of interest. The principle articles are: A Model Compound Condensing Engine, detail drawings; A 2½ in. Gauge Locomotive, 2-8-2 type, detail drawings; Some Commercial Engineering Models and their Uses, illustrated; Foundry Work for Model Engineers, detail drawings; A fully illustrated description of the Models and other Exhibits at the Annual Model Engineering Exhibition in London. Some alterations and additions to a plain lathe, with drawings, etc., etc.

The Announcement that **Everyday Science** had ceased publication was a disappointment to many of our subscribers. Its articles on Model Railway work were much appreciated. If any of our readers would like to have their numbers bound we can attend to that for them. Should anyone wish to sell their numbers send us in a complete list of what you have and we will make you an offer.

In the last issue of The Modelmaker we published a list of American Model Engineer Societies. We would suggest that all of our readers living within reach of any one of those Societies should write the Secretary for full particulars. The more the Societies develop the more interest will be taken in Model Making in the U. S. Give it a boost.

Our Model Sailing Boat enthusiasts will be much interested in a book recently issued. The Author, Mr. E. W. Hobbs, has written a number of articles on Model boats for **The Model Engineer.** The title of his new work is Model Sailing Boats, Their Design, Building and Sailing, including a chapter, "Modelling Square Rigged Ships." The work is profusely illustrated.

Announcement has just been made that Mr. Henry Greenly's new work on Model Railway Engineering will soon be issued. All those who are interested should write us for fuller particulars.

Messrs. Percival Marshall & Co. have commenced the issue of a new Series of Model Makers Handbooks. The first three are entitled: Marking out for Machinists; Practical Hand Forging; Fitting and Adjusting Bearings. We can honestly recommend them as worth a place in our Modelmakers Library.

We have to acknowledge the receipt of many complimentary letters from our Readers and good wishes for the success of **The Modelmaker,** also the following gentlemen who have sent us photos of some of their Models: Mr. Arthur W. Line, Mr. Cecil G. Hamilton, Mr. J. H. Hinchman and Mr. R. E. Washburn We hope later on to give some description of some of these fine Models.

BOOK REVIEWS

Marking Out for Machinists, by Capt. R. Twelvetrees, 69 pp. 34 illus, 6¼ x 4 in., paper, 35 cents.

Upon the accuracy of Marking Out largely depends the perfection of the finished article. This small guide will prove a valuable help.

Practical Hand Forging, by Capt. R. Twelvetrees, 64 pp., 40 illus., 6¼ x 4 in., paper, 35 cents.

The author hopes that the contents of this little book will assist the ordinary mechanic in applying some of the simple processes to his own work.

Fitting and Adjusting Bearings, by Capt. R. Twelvetrees, 60 pp., 29 illus., 6¼ x 4 in., paper, 35 cents.

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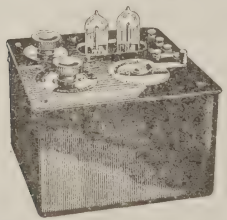

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THE MODELMAKER

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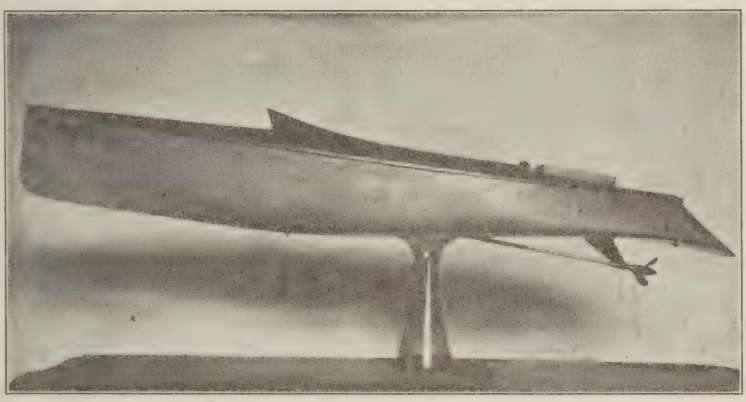

HIGH SPEED RACING BOAT

Designed and Built by

MR. CECIL E. HAMILTON

Length 39" O. A., beam 7", draught at speed 2".

Power Plant, flash boiler and blow torch, with twin cylinder engine, 5/8" X 5/8", single gunmetal screw 2¼" diam., with raking blades. Displacement complete 11 lbs.

THE MODELMAKER

Published by SPON & CHAMBERLAIN
120-122 LIBERTY ST., NEW YORK, N. Y.

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OUR FOREWORD

Since the publication of the March issue of THE MODELMAKER a number of letters have been received in regard to Model Locomotives. Six of these refer to blue prints and castings of locomotives which will be of interest to our readers.

The first writer can supply sets of blue prints of model locomotives for 0", 1", 2½" and 3½" gauge.

The second has nearly completed a set of drawings (59) of a ½" scale model of P. R. R. Pacific K4S locomotive; also a set of drawings for the same engine in ¾" scale. Most of the patterns have been made, the balance will be completed shortly. The Designer hopes to be able to supply sets of blue prints and castings in the near future.

The third can supply complete sets of blue prints and castings for ½" scale 0-6-0 Switch engine; also 4-4-0 American type. Castings for Vulcan type freight car trucks, 4 and 6 wheel passenger car trucks, and Climax automatic car coupler. Complete models have been built.

The fourth is preparing a set of drawings for a Pacific 4-6-2 locomotive, ¾" to 1 foot.

The fifth is making steel dies for casting scale 33" American type car wheels; also freight car trucks 1¼", or 0" gauge.

The sixth is from a Canadian reader to the effect that he has secured the Agency for an English maker of model locomotives and has ordered a stock of these goods.

Mr. F. D. Grimke has shown some samples of a very ingenious rail chair he has designed. Its application is very simple yet effective. The cost for the steel dies is considerable so before putting this work in hand he would like to hear from prospective customers. Address him c/o THE MODELMAKER.

It is certainly encouraging for the Novice to know that there are a number of sets of blue prints of American model locomotives to be had. Still he must remember that this is only one of the three stages the manufacturer has to go through before he is ready to supply complete sets of blue prints, castings and other materials for a model that he is sure, if carefully constructed, will operate and give good satisfaction.

In the construction of the Master Model a certain amount of development work must be done. Errors, or omissions, may be found in the drawings, these have to be rectified. Mistakes may have been made in some of the patterns, these must be changed. Alterations or slight modifications may be found beneficial, and so on until the model is completed and put under steam. Even then it may be found expedient to make some minor changes. All of which should be carefully noted on the original drawings and the patterns changed to fit the new requirements.

The price asked for such goods may seem high but they are cheap at the price. Slipshod drawings and shoddy castings are dear at any price.

In closing the writer wishes to emphasize the importance of fully dimensioned drawings with list of materials, and that the castings should be of good material, free from scale, hard spots and blow holes. Not too thin, this may prevent the modelmaker getting as nice a finish as he would wish; or unnecessary thick, this would entail extra labor in machining the part to size.

Let your slogan be—ONLY THE BEST.

Should any of our readers wish to get in communication with any of the writers enclose a stamped envelope, give the number of the letter and we will gladly forward your communication.

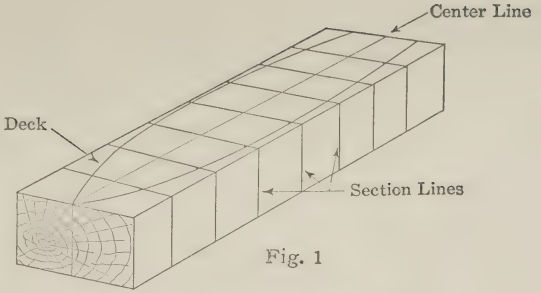


Fig. 1

Block after being planed and lined up

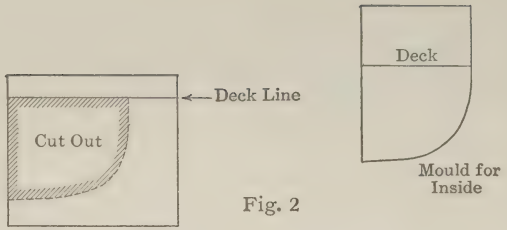


Fig. 2

Cardboard mould for outside

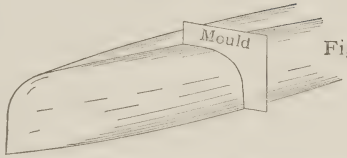


Fig. 3

Mould being fitted to Hull while Shaping

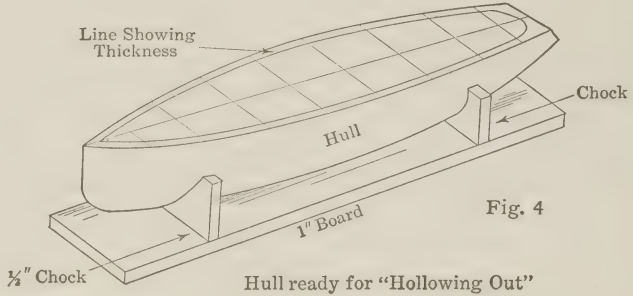


Fig. 4

Hull ready for "Hollowing Out"

A HIGH SPEED RACING BOAT

BY

CECIL E. HAMILTON

The Model Racing Boat was built by the writer some five years ago. As originally designed it had a rather curious stern, rising from the mid section in a curve until the transom was about a quarter of an inch clear of the W.L. Not liking the looks of the after body it was decided to alter it, so a friend who had had considerable experience in speed boat work was called in and with his aid a new set of lines were prepared, but the fore body was retained from the mid section. After the lines were finished and corrected the next consideration was the method of building. The summer was approaching and as the boat was wanted then, the quickest way was to cut it out of a block of pine, although had there been time in all probability it would have been constructed from metal, as the writer had made a number of hulls from hard drawn sheet brass and they had proved very successful.

A block of pine was procured and after having carefully planed it true and square on all four sides (the block then measured 40″x7.5″x4.75″) a line was drawn down it on one side, (that side which was going to be the deck) exactly in the center. From this line the section lines were drawn round the block three inches apart and at this stage the job was something like Fig. 1. The next thing done was transferring the deck half-breadths from the body-plan to the face of the block and from the spots obtained a thin batten of wood (spruce 3/16″x3/16″) was bent to the curve and pinned down and a pencil run round to mark the deck edge, the batten then reversed to mark the other side. Some thin cardboard was next procured and a mould for each half-section prepared (Fig. 2). Firmer chisels and plane were then used and the hull shaped out until the moulds fitted snug (Fig. 3) the hull then being glass papered it was ready for "hollowing out."

In order to hold the hull and save it from being crushed, two pieces of pine ½″ thick were cut out the shape of one section near the bow and one near the stern, these being screwed to a pine board 1″ thick and the hull then set in the chocks (Fig. 4). Moulds were prepared for the inside allowing the sides 3/16″ thick and the floor ⅜″ and the hull was then dug out. Here let it be noted that with very careful handling of the tools the sides could be reduced to ⅛″ thick. The hull was painted 3 coats and sandpapered after the first and second coat, a very smooth finish was thus obtained.

The boat has long since passed from the writer's possession and with it the lines, but should it be of sufficient interest to readers of "THE MODELMAKER," a set of lines for a similar model could be prepared from the information in the writer's possession. It will be noted from the photograph on the front page that the deck is fitted, but that was only pinned on while the photo was being taken, as there is only a little piece of deck forward and the same aft. The deck was fitted after the machinery had been installed.

The power plant will be described in a future issue of this paper. It will also be noted that there are no actual weights or measurements but these would be given in full with the lines. Should any point not be quite clear the writer will gladly answer questions through "THE MODELMAKER."

BOOK REVIEWS

Lathe Works, by P. N. Hasluck, 11th ed. enlarged 244 pages, illus. 7¼x5 in., cloth, $2.00.

A practical treatise on the tools, appliances and processes employed in the art of metal turning, screw cutting, boring, drilling, &c.

Home-Owners Handbook, by A. C. Lescarboura. 503 pages, illus., and 1 folding plate, 8x5¼in., cloth, $2.50.

A guide for the man about to build a home. Commencing with the purchase of the land, plans, foundations, different kind of buildings, building material, plumbing, lighting, heating, decoration, painting, &c., right up to the moment it is ready for occupancy. A fund of practical and valuable information for all who are interested.

NEWS ITEMS

Our Locomotive enthusiasts will be glad to hear that Mr. Henry Greenly has commenced a series of articles on "A Design for a Model 'Atlantic' or 'Pacific' Locomotive for 2½ in. Gauge." Starting in the January 1924 issue of Junior Mechanics. The text is fully illustrated with detail drawings. This paper is published every month, annual subscription $1.25 post paid (Spon & Chamberlain).

The Chicago Society of Model Engineers have appointed a Committee on "Standard Dimensions and Recommended Practice for Model Freight and Passenger Cars." They will proceed at once to decide upon this question. Drawings will then be made embodying their recommendations. This is a most important move in the right direction.

THE CONSTRUCTION OF MODEL
MARINE STEAM ENGINES

By F. DRAYTON GRIMKE

A SINGLE CYLINDER DOUBLE-ACTING ENGINE, WITH REVERSING GEAR (5/8" BORE X 5/8" STROKE)

CHAPTER III.

If one cares, the valve rod can be arranged to permit the valve to be adjusted for travel. It is done in this way.

Instead of groove being filed in the rod, that end of the rod is threaded for ½". A hole is drilled in the boss of the valve, to permit the valve to slide back and forth. At right angles to the hole, a slot is filed in the boss, wide and deep enough to permit a nut, threaded on the valve rod to revolve freely without binding. Thus by turning the nut one way or another, the valve travel can be adjusted.

If a non-reversing engine is being made, ignore the next five items.

REVERSING LEVER. The reversing lever (Fig. 27) is smoothed up with a file, and three holes drilled. The center of the first hole is 3/32" from the lower end of the lever and is drilled by using a No. 44 drill. The second hole, or the point at which the lever is fulcrumed is 1 1/32" from the first hole. It is drilled and tapped for a 2 x 56 machine screw. The third hole, for the lock, is located 9/16" from the fulcrum hole and is also drilled and tapped for 2 x 56 machine screw.

REVERSING LEVER LOCK NUT. The lock nut (Fig. 28) can be made from a piece of brass rod 1/8" diameter and a 1/16" or 3/32" piece of drill rod. A hole is drilled and tapped for a 2 x 56 machine screw through the center of the rod and the drill rod, shaped like a small handle ,is either forced or threaded into the brass piece at right angles to the center line of the brass rod. When this is done, the lock may be finished by polishing with emery cloth.

LINK .The link (Fig. 29) is finished by filing. The holes, in which the eccentric rod yokes fit, are drilled 9/16" apart to clear a 2 x 56 machine screw. The slot in the link is filed with a dead smooth Barrette second cut file.

REVERSING LEVER BRACKET. The bracket (Fig. 30) is filed true all over, and clamped to the left side of the valve chest, as shown in the assembly drawing. Two centers are located 5/16" apart and two holes made for a 2 x 56 machine screw. The holes in the bracket are cleared with a No. 44

drill. The hole in the bracket is located $\frac{9}{16}$" away from the center of the slot and drilled with a No. 45 drill to clear a 2 x 56 screw.

SWINGING LINK. The centers of the tapped holes in the swinging link (Fig. 31) are $1\frac{7}{16}$" apart. They are drilled and tapped for a 2 x 56 machine screw. The swinging link may be finished in the accustomed manner.

FLYWHEEL. The flywheel (Fig. 32) is finished by centering the flywheel as near as possible and gripping it in the lathe chuck by the rim. Drill a $\frac{3}{16}$" hole through the center and mount the wheel on the mandrel to run between the lathe centers.

Face the sides and turn the rim down until the wheel is $1\frac{1}{2}$" diameter . Face the boss on both sides. The inside of the wheel may be left rough or smooth as may be desired.

It will be noted that there are two prongs diametrically opposite to each other $\frac{1}{2}$" from the centre of the flywheel of 3/32" drill rod $\frac{5}{8}$" long. These engage a cross piece fastened on the end of the tail shaft and act as a universal joint.

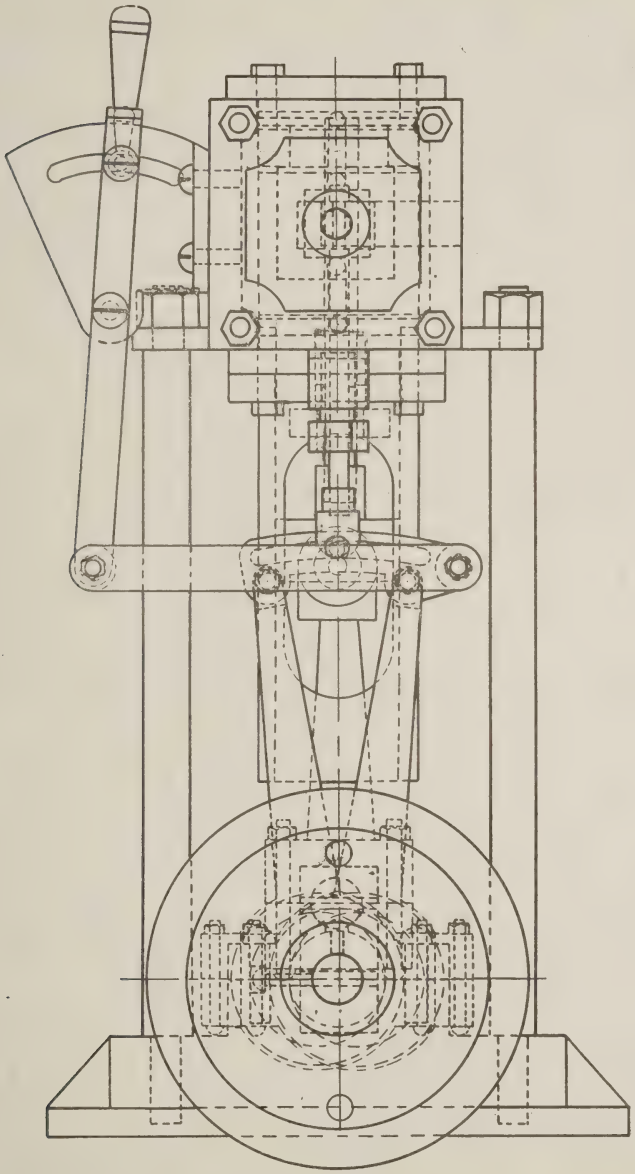
If one desires a finer balance of the crank shaft a section of the web of the flywheel on the same side as the crank may be cut away. It really does not matter greatly but it is a little detail which helps to make the engine run better.

ASSEMBLY. The bearing caps are unscrewed from the base. The shaft is coated with either red or blue oil paint and placed in the bearings. The caps are replaced and the shaft given a few twirls. When the shaft is removed it will be noted that some of the places in the bearings will be painted, while others will be perfectly clean. The places, so coated with paint, are known as high spots and must be removed, until the whole bearing shows a uniform, thin coating of paint. This removing process is known as scraping and is as follows: Take an old triangular file, one that can no longer be used for filing, and at one end carefully grind out all file marks, taking care not to draw its temper. Grind all three sides evenly until they are bright, the edges sharp and meet at a point neither too long nor too short. Those who have scraped bearings will know how to proceed without any further instructins. Those who don't know, need a word of caution. The work must be done slowly and carefully. Upon no circumstance must emery cloth be used, as the continued use of emery will have a tendency to flatten out the rounded surface.

The scraper is lightly held in one hand, the base firmly in the other or in a vise. The scraper is moved back and forth over the high spots by rotating the wrist. It must be remembered that only a little metal need be removed in order to make a perfect bearing. It is better to test the bearing by placing the shaft in it and turning it. This scraping process is kept up until, as stated above, a uniform coating of paint shows over the bearings.

It is also noted that a little paint, only enough to thinly coat the shaft, is better than using great thick gobs.

The four standards are screwed home into the base using



the long threaded portion of the standard. If the alternative standards are used, it does not matter which end of the drill-rod are screwed home. When the four rods are in place, the brass tubes are slipped on.

The piston rod is screwed into the piston. Some twine, grease or oil soaked, is wrapped around the piston until it slightly projects. The end of the string, is made fast by poking under the layer underneath.

The piston is placed in the cylinder by a rotary motion; it cannot be shoved into place on account of the projecting packing. Gaskets can be made in one of two methods. First from paper and shellac, or second, from heavy tin foil. The writer prefers the latter method, as it is a cleaner process. A gasket is placed on the bottom cylinder cover and the cover is temporarily bolted on. The piston is then forced down as far as it will go, so as to place rod beyond the stuffing box. Oil soaked string is wrapped around the piston rod and is forced into the stuffing box and tamped down by means of an awl. After the gland is screwed down, the cross head is screwed onto the piston rod. The temporary bolts are removed from the cylinder cover and the cross head tunnel bolted on. Care should be taken that all marks made in machining for identification prposes should check up when the actual assembly work is undertaken.

The cylinder may now be bolted on to the standards and the connecting rod placed in position. The main bearing of the connecting rod should be scraped in a manner similar to the shaft bearigs.

If upon scraping, the connecting rod is found to bind when assembled on the shaft and tightened up, shims made of Taggers tin may be inserted to give the proper fit. The wrist pin is inserted and the washer screwed on tight.

The two eccentrics are clamped to the shaft by the set screws. The eccentric rods are mounted in the same manner as the connecting rod. The link is bolted to the rods.

The reversing lever bracket is screwed to the steam chest. Before the steam chest is mounted to the cylinder, however, the valve rod is passed through the stuffing box which is packed in a method similar to that given in the case of packing the piston rod. The valve should be lapped in the following manner: The glass surface plate should be charged with red paint and the valve rubbed around to see where the high spots are. When this is determined, the valve is rubbed gently in a mixture of fine emery dust and oil with a circular motion. The valve should be rubbed no longer than is necessary to develop a true surface. The valve is slipped over the filed portion of the valve rod. A gasket is made and fitted in place. Temporary bolts hold the valve chest on. The valve rod should be moved down, so that the yoke may straddle the link and the pin inserted. The reverse lever is fastened to the bracket and the swinging link bolted to the lower end of th reverse lever and the link. The locking nut bolt is fastened to the reverse lever. The lever should be moved from one

position to another, that is all the way over in one position to see if the eccentric rod lines up with the valve rod, and to see that the valve is in neutral position when the reverse lever is in midposition.

VALVE SETTING. The eccentric without the shoulder is the back eccentric and the eccentric with the shoulder is the forward eccentric.

The reverse lever should be locked in either one of the two positions. This position is chosen reverse position. Loosen the eccentric rod from the eccentric. It is determined at what point cutoff should be chosen. On account of the comparative inefficiency of so small a model, steam cannot to a certain extent be conserved and so the cutoff is ½ to ¾ the stroke.

The set screw of the eccentric is loosened and the eccentric set at 120° behind the crank, that is, if the center line of the eccentric were produced to intersect the center line of the crank, the lines would intersect at an angle of 120°. Tighten the eccentric and refasten eccentric rod. When the crank is turned until the piston has moved ¼ of the stroke the valve should begin to withdraw. The port should be half open and fully opened when the piston has reached 0.6 of the stroke.

The reverse lever is unlocked and set in the forward position. The forward eccentric should be set 120° ahead of the crank.

FINAL ADJUSTMENTS. Some heavy cylinder oil is placed in the cylinder so that a layer of at least $\frac{1}{16}$" to $\frac{1}{8}$" is formed.

If one has a lathe, the engine may be mounted between the lathe centers, that is, the crankshaft aligned with the lathe center and proper packing placed between the base of the engine and the bed of the lathe.

The shaft may be gripped by a scroll chuck, mounted on the nose of the lathe, and the other end resting in a female center placed in the tail stock. Oil should be placed in the female center before the shaft end is placed in it.

The lathe should be driven at the lowest possible speed. Every moving part of the engine is now flooded with oil, rather too much than too little. Before the power is turned on, slowly rotate the lathe by hand to see that no part binds on the engine. If there is a point where the engine will not turn over, take it from the lathe and look carefully to see where the fault lies, and correct it. The engine will be hard to turn over, due to the fact that the moving parts have not been worn in. It is similar to the case of a new automobile.

When you are satisfied that there will be no binding (because if there is, something will probably break) turn on the slowest speed of the lathe. Run for several hours, stopping every fifteen or twenty minutes to oil, tighten any bolts, nuts or screws that may have worked loose, and throw into reverse position. In every case, the reverse lever should be locked in each position as if it were actually working.

If, at the end of several hours, the engine turns over easily by hand, proceed according to the next instructions. If not, carefully examine it and remedy any trouble and run in the lathe until it moves freely.

Before the cylinder cover and steam chest cover are bolted on gaskets must be made in a manner previously described.

The steam and exhaust pipes are ⅛" copper pipes, threaded and bent to proper shape before they are screwed in. The joints may be packed with white lead if there is a tendency for a leak. If white lead will not remedy the leak, the pipes will have to be sweated in place.

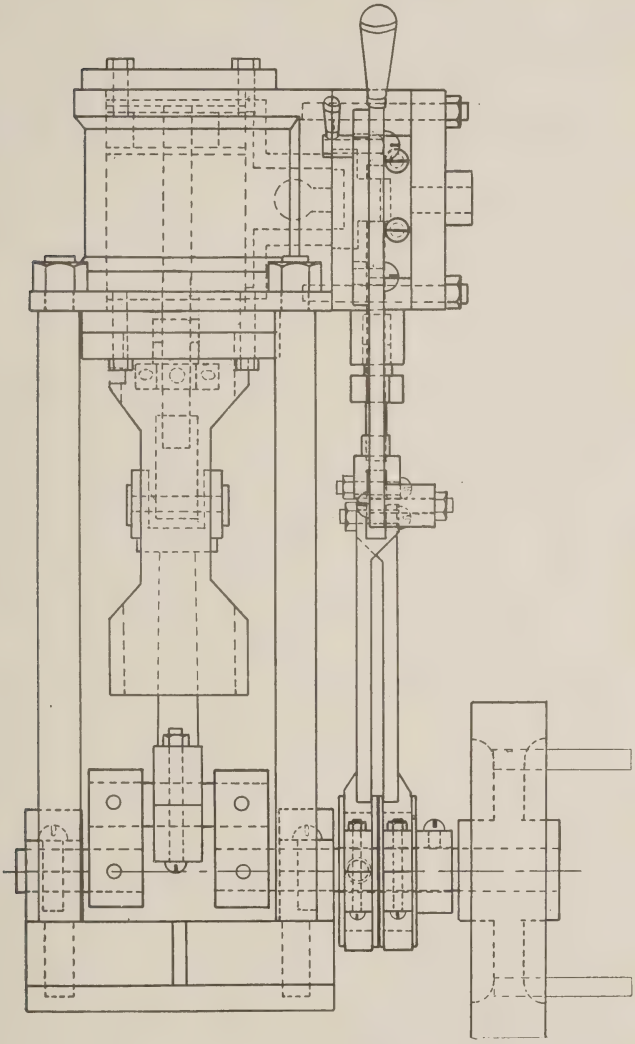
The flywheel is forced onto the shaft and the engine is ready to run.

Someone will probably question me as to why a small lubricator was not placed on top of the cylinder. The best possible answer is as follows. The lubricator will not, in all probability, be more than ¼" high and to make it one has to be an expert machinist, besides using a screw cutting lathe. If the job is badly done, it will spoil the appearance of the engine.

STEAM LINE LUBRICATOR. The writer prefers a steam line lubricator because it holds a larger amount of oil. The displacement type is the most simple to build. This lubricator is attached to the main steam pipe somewhere between the throttle and the engine. Its operation is as follows: It consists of a cylinder with a removable cap. In the bottom there is a small drain cock. At some point near the top, but not enough to interfere with the removable cap there is a pipe with a comparatively small inside bore. Remove the cap, fill the cylinder with heavy cylinder oil and replace cap. The steam rushing by the small pipe with great velocity will also enter the cylinder. Upon striking the comparatively cooler walls of the lubricator it will condense and a drop of water is formed, which will immediately sink to the bottom of the cylinder. As oil has less specific gravity than water, a drop of oil will be displaced into the steam pipe and is completely atomized, thus lubricating all surfaces upon which the steam comes in contact. When all the oil has been displaced, the drain cock opened and all water drained from the cylinder, the cylinder is refilled with oil.

FINAL WORD. Treat the engine as you would any piece of machinery. You do not abuse a large engine so why abuse the model Do not overload it and do not race it, that is, if mounted in a boat do not hold the boat in the air and let the propeller spin. Besides wracking the boat, it pulls the shaft bearings and causes the stuffing box to leak. **Use it as it is intended to be used.** If properly taken care of, with frequent inspections, there is no reason why the engine should not last for years and if by chance the boat encounters rough seas there isn't the slightest danger of the engine giving out and the boat foundering with all hands on board.

The writer wishes to acknowledge his indebtedness to Mr. Thomas Bray for checking up the drawings and for several valuable suggestions.



LIST OF TOOLS REQUIRED

TOOLS, Machine

1 Drill press at least ¾″ but preferably 1″.
1 Lathe with scroll chuck either 2″ or 3″ diameter and 1 chuck with independent jaws.
1 Complete set of cutting tools for Lathe.

TOOLS, Hand

1 Ball pein hammer.
1 Brass hammer.
1 Vise (as large as possible).
1 Hacksaw with 6 coarse blades, 6 fine blades.

FILES

Smoth
Dead smooth
Bastard
Second cut
" " dead smooth Barrette

DRILLS

Nos. 51, 44, 38, 32, 21, 16
3/64″, 7/64″, 1/8″ 9/64″ 1/2″ 5/8″ 11/64″

REAMERS, Hand

7/64″, 1/2″, 5/8″

TAPS AND DIES

1 Tap Handle
1 Die Stock
1 0x80 Tap and Die
1 2x56 " " "
1 5x40 " " "
1 10x30 " " "
1 12x24 " " "
all taps and dies are A. S. M. E. standard.

MISCELLANEOUS

Emery Cloth, fine
2 large clamps
1 piece of plate glass at least 15″x15″
1 surface gauge
1 6″ flexible steel rule graduated in 64ths and 32nds
1 Scribe
1 Set of V blocks
1 Center punch
1 Flat cold chisel
1 Adjustable Trisquare
Combined Drill and Countersink, Large, Medium, Small

(To be continued)

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EVERYTHING HAS A VALUE. SOME OTHER FELLOW WANTS IT IF YOU DO NOT

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We reserve the right to refuse any or all advertisements.

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Blue Prints of Ships for Model Makers, send for circular. G. B. Douglas, 165 Summit Ave., Upper Montclair, N. J.

Model Torpedo Boat, 39" long, Stuart twin single acting engine, centre flue boiler and blow lamp, complete in working order, $30.00. John Matthews, 6349 Dorchester Ave., Chicago, Ills.

Two Cylinder Model Marine Engine, link reversing gear, 1 3/16 in. bore. Fine running order and appearance. Price $75. Photo. Bathe Co., 5214 Woodland Ave., Philadelphia, Pa.

The Handy Sketching Book. Just the thing to slip in your pocket to make quick and accurate sketches of machine parts. Consisting of sectional paper ruled to exact 8 to 1 inch size. 5x8 in., bound in limp boards, price 35 cents. Spon & Chamberlain, 120 Liberty St., New York.

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Large Sectional Drawings showing every part numbered and named of the following: Modern Submarine—Freight Box Car—Ry. Passenger Car—Gondola Car. Price 35 cents each, from Spon & Chamberlain.

Locomotive Charts, large Sectional Views numbered with a list of the parts. Price 25 cents each. American Type—Atlantic Type—Consolidation Type with Walschaerts Valve Gear—Micardo, or 2-8-2—Passenger and Sleeping Car. Pacific Type or 4-6-2 size, 44x17 in., price 50 cents, Spon & Chamberlain.

2-Cylinder Marine Engine with reversing gear, double acting, ⅝ in. bore x ⅝ in. stroke. A fine little working Model. $45.00 Express prepaid. Box 15, Modelmaker.

Single Cylinder Marine Engine and pump (see illustration on front page). of the January issue Modelmaker. A fine working Model, new. $60.00. Box 9. Modelmaker.

Castings—2 cylinder, single acting enclosed, engine castings only and 1 blue print, aluminum, $5.00 insured Mail. Box 17, Modelmaker.

Blue Prints, 3 large sheets, Single Cylinder, double acting Marine Engine with reversing gear, ⅝ in. bore, ⅝ in. stroke. Complete details and list of Materials. $2.10 registered Mail. Box 13, Modelmaker.

Blue prints, 6 large sheets, 2-Cylinder double acting Marine Engine with reversing gear, ⅝ in. bore, ⅝ in. stroke. Complete details and list of Materials, $3.60 registered Mail. Box 13, Modelmaker.

Marine Engine, Gunmetal Castings. Complete set, single cylinder Marine Engine with reversing gear with all nuts, bolts and parts, 1 blue print, $7.50 insured Mail. Box 17, Modelmaker.

Circular Firetube Boiler, with 22 7/16 in. tubes inside diam.; length 5 in.; diam. 4½ in.; with steam dome, safety valve and water glass. Made of heavy brass silver soldered and riveted, with 8 longitudinal stays. Weight 4½ lb. Blow Torch with fuel tank fitted with stop cock and needle valve, length 6½ in., diam. 3½ in., Made of heavy spun copper all joints soldered. Has been used but in good condition. $20.00, express additional. Box 19, Modelmaker.

Copper Ventilators for Model boats, fine Workmanship, various sizes, $2.00 each, $3.50 per pair, Insured Mail. Box 21, Modelmaker.

NEWS ITEMS

The Montclair Model Engineers Club. The March meeting was held at the residence of Mr. G. B. Douglas. Mr. H. L. Stone, Editor of Yachting, delivered a very interesting address on The 1923 Yacht Race to Bermuda. A Stereopticon was used to show over 50 pictures of the various boats. The April meeting was held at the home of Mr. H. E. Taylor. Mr. B. Audsley spoke about his cardboard Models, exhibiting several very beautiful examples. A Gothic Cathedral entrance door, and a beautiful carved window frame, the stained glass being represented by colored mica. He also exhibited a number of photographs of other Models. A high altar for a Roman Catholic Church, The Victor Phonograph Works at Camden, and an English Railway terminal with piers, ships and railway track (scale 1 in. to 40 ft.).

Canadian Model Engineers and Scientific Enthusiasts will be interested to know there is a real live Society right in their midst. The Canadian Model Engineering Club. Meetings are held monthly at the Central Technical School, Toronto. A number of members are actively engaged in the construction of Models to be exhibited at the Canadian National Exhibition next September. Write at once to the Sec., Mr. Jas. J. Joslin, c/o Dominion Bridge Co., Ltd., Structural Dept., Lachine, Quebec, and get full particulars.

The March and April Numbers of THE MODEL ENGINEER contain the following—Model of a Jet Condensing Beam Engine (drawings). A 2 in. Scale Model Traction Engine (illus.). Some First Principles of Power Boat Building and Running. Locomotive News and Notes (illus.). Making Model Pressure Gauges (drawings). Workshop Problems Competition (illus.). Building a Small Workshop (drawings). Electrical News and Notes. Workshop Notes. Practical Letters from Our Readers. Construction of a Gas Blow Torch (illus.), etc., etc.

It will interest our many readers to learn that they can now procure the WADE bench lathe in the United States from the American representatives, the Gerold Company. The WADE lathe is a robust, accurately made tool designed for the model maker. It will turn material up to 12 inches by four inches and is suitable for all metals, wood and ebonite. Fitted with three speed cone pulley and slide rest which travels the full length of the bed and has cross feed. There is a complete range of accessories and tools which give the machine the widest scope. By use of the thred-cutting attachment 8 to 40 threads per inch can be cut and self-acting feed is obtained on the slide-rest—a great advantage to any lathe. Drive is by means of electric motor from regular light socket, or by foot treadle.

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Our Model Boat Enthusiasts should get in touch with The Bathe Manufacturing Co. They manufacture a line of American Marine Engines, single and two-cylinder, steam turbines, boilers and boiler fittings, model ship and naval fittings, &c. They build Models to order and do repair work. They also carry a full line of Stationary Engines, Modelmakers' supplies, brass and copper piping, nuts and bolts, small taps and drills. A special feature of their business is making reports upon Amateur's work, answering questions relating thereto and giving advice for which Professional Service a small charge is made. Send them 20 cents for a copy of their new illustrated catalogue and get posted.

We have just received from Mr. A. W. Line blue prints of Model passenger car wheels 36 in. diam. (¾ in.) for 1¼ in. gauge, ¼ in. scale, and Model freight car wheels 33 in. diam. (11/16 in.) for the same gauge. Also blue prints of Bettendorf style 4-wheel Model freight car trucks. He informs us he will be able to supply these castings shortly.

Special Offer Back Volumes of the Model Engineer. We can supply any of the following vols. in numbers: Vol. 6, Jan.-June 1902; Vol. 7, July-Dec. 1902; Vol. 12, Jan.-June 1905; Vol. 13, July-Dec. 1905; Vol. 17, July-Dec. 1907; Vol. 23, July-Dec. 1910; Vol. 24, Jan.-June 1911; Vol. 25, July-Dec. 1911; Vol. 27, July-Dec. 1912; Vol. 26, Jan.-June 1912; Vol. 29, July-Dec. 1913; Vol. 22, Jan.-June 1910; Price $1.75 each vol., postpaid. Spon & C. 120 Liberty St., New York.

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INVENTIONS. How to Protect, Sell and Buy Them. By FREDERIC B. WRIGHT. Counsellor in Patent Causes. This book is especially written for the use of Inventors, instructing them how to place their inventions before an Attorney clearly; the rights given them under the Law, Patent specifications, Legal forms, and the many points necessary for an Inventor to know to protect himself under the American Laws. The most practical and clearly written American book on this subject, especially intended for the uninitiated. 114 pages, and 1 sample pattern drawing.

WOODWORK JOINTS. How to make and where to use them. A new revised and enlarged edition. Contents of Chapters: 1. Mortise and tenon joints. 2. Lap joints. 3. Dove-tail joints. 4. "Glue" joints. 5. Scarfing joints and joints for lengthening timbers. 6. Circular work, showing how to make joined woodwork frames in the form of ovals and circles. The work describes clearly the construction of the principle joints used in carpentry and joinery, and shows not only how to set them out, but indicates for what purpose they are best suited. 101 pages, 178 illustrations.

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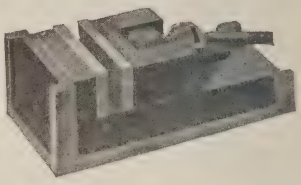

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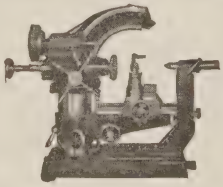

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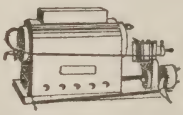

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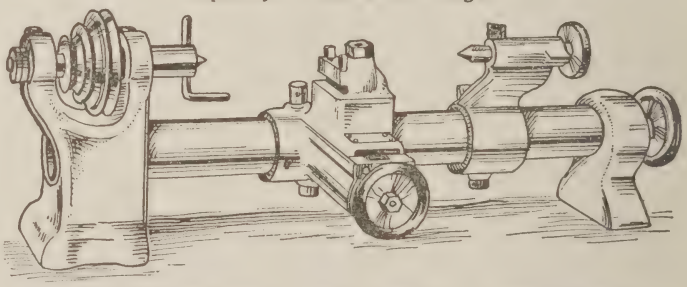

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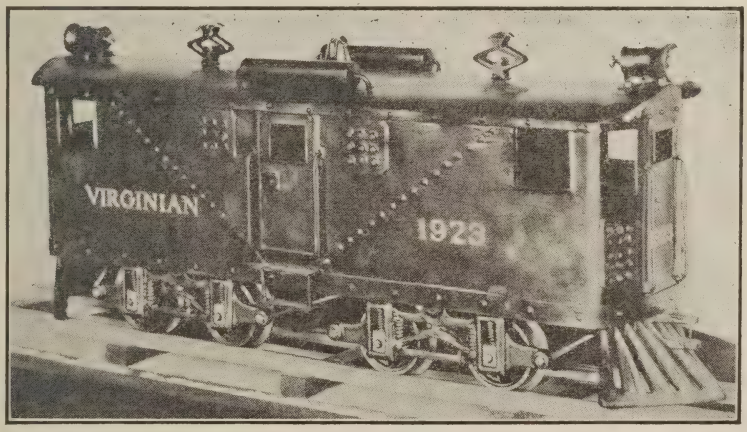

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THE MODELMAKER

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OUR FOREWORD

CHOOSING A LATHE

A good lathe is the most important tool in the Model Makers equipment.

In discussing this with a few experienced Modelmakers the following qualifications seem to be the most important.

It should be the product of a reliable firm still in business.

A screw cutting back geared lathe, about three feet between centres with a nine inch swing, having a heavy bed and substantial head and tail stock, mounted on a firm ridged stand to eliminate vibration.

A hollow spindle with a hole at least ¾" in diameter.

Adjustable bearings.

Of good workmanship, guaranteed to turn out accurate work up to 2000th of an inch.

Fitted with independent, universal, and draw chucks, and face plate.

With adjustable tool post and compound rest.

Having from three to six speeds.

Motor drive preferred.

A lathe of this description would be ideal but there are two serious drawbacks for many of our readers, viz.—the amount of space it would occupy and the cost.

For the beginner the writer would recommend a well designed screw-cutting bench lathe; about 12" between centres and a swing of about 4"; fitted with face plate independent and draw chucks; with hollow spindle; three speeds; motor drive.

There are several styles of small precision lathes on the market. Some have a flat bed while two are of the round bed type. The latter is preferable because the lead screw runs through the hollow bed which protects the screw from dirt and metal chips.

Having handled many sets of small engine castings and being familiar with the size of each casting the writer feels sure that a lathe of these dimensions would be quite large enough to fill the ordinary requirements of the Modelmaker.

HIGH SPEED ELECTRIC LOCOMOTIVE "VIRGINIAN"

By Mr. R. E. Washburn

The design for this Electric Locomotive was made partly from the drawings of its prototype, and partly from Mr. A. W. Line's fine Electric Locomotive which was on Exhibition at the Grand Central Depot, New York.

The scale is $\frac{7}{16}$" with a 2" gauge.

The sides, ends and roof of the cab are made from sheet brass soldered together, the floor of the cab is a piece of steel plate. Small brass nails were used to represent the bolts.

The two air drums and overhead current collectors are only dummies, but the two head lights each contain a 14 volt bulb.

The cab is mounted on two standard 4 wheel motor trucks made by the Voltamp Electric Mfg. Co., which operate on 8-14 Volt A. C. current through a transformer. The motors are reversing and work independently of each other. Either can be shut off while the other is in operation. The control is worked by a side lever on each truck.

The wheels are 1⅜" dia., flanges 1⅛" and the trucks have cast metal axel boxes with real springs. The pilots and couplings are castings in one piece which with the cab fittings are of standard manufacture.

The overall dimensions are: length 16½", width 4", height 6¾", weight about 10 lbs.

Speed obtained: 175 ft. per min. with 7 cars of an approximate weight of about 30 lbs. Owing to the light weight of the engine the tractive power is not as great as it should be. This no doubt could be increased by adding weight, in the form of strips of sheet lead secured to the floor of the cab.

Trials were made over a circular track with a diameter of 80 in. of two tin plate rails on wood ties. The current was taken from one of the rails through the wheels. This engine has worked satisfactorily on a much smaller radius.

A MODEL OF PENNSYLVANIA RAILROAD LOCOMOTIVE

4-6-2 PASSENGER CLASS K 4s
½" SCALE 2½" GAUGE

H. J. COVENTRY

The model about to be described is of a type of engine produced by the P. R. R. in 1916 for heavy, fast passenger traffic; and was, as it still is, remarkable for its large power in relation to its light weight.

These engines have the following chief dimensions:—

Cylinders, 27" bore × 28" stroke; Boiler Pressure, 205 lbs. sq. in.; Diameter of drivers, 80"; Tractive Effort; 41.845 lbs.; Total Heating Surface, 4035 sq. ft.; Superheater Heating Surface, 154 sq. ft.; Grate Area, 70 sq. ft.; Weight on Drivers, 201.800 lbs.; Total Weight, 308.900 lbs.

While these engines are not the easiest to model, especially the boiler, owing to its Belpaire firebox, yet it makes a distinctive subject for the model maker's art, besides giving a powerful working model.

When particulars and details of these engines were first published in 1916, the writer was rather struck with the idea of building a model to ⅜" scale.

Drawings and patterns were proceeded with as far as the war conditions, of that time, would allow.

It was not, however, till recently that the idea of making the same engine to ½" scale was taken up. This involved a completely new design and set of drawings and forms the subject matter of these notes.

The first step was to lay out an outline elevation full size of model to scale of half inch equal to one foot, or 1/24 full size of prototype. Having done this, and established the maximum dimensions, the model design proper was proceeded with.

Now all locomotive design consists of the harmonizing of three things, first, the generator or boiler; second, the engine that converts the heat of the steam into mechanical work, and third, adhesive weight, by means of which, the work of cylinders is transmitted to rail.

A model locomotive of a particular type is then limited by the boiler outline, and the problem resolves itself into provision of as powerful an engine, as boiler will supply, and necessary weight to absorb the work done by cylinders.

It will be noticed that the boiler takes quite a variety of outlines, tapers, etc., so that it was felt nothing was to be gained by following the outline too closely. The boiler barrel is therefore a solid drawn brass or copper tube of diameter

slightly less than that of smokebox. The correct outline is obtained by wood packing. The firebox outline is fixed by the scale outline and center line of barrel, the combination chamber existing in the prototype not being used in the model. Next the question of tubes was decided, the three principal features being kept in mind, namely, flue gas area, space between tubes, and heating surface.

Having fixed the dimensions of the boiler and its parts, it is possible to estimate the evaporative capacity as follows:—

Firebox heating surface	=	46	sq. ins.
Tube " "	=	124	" "
Total " "	=	170	" "

Taking Greenly's figure of 1 cubic inch of water evaporated per 100 sq. ins. heating surface, we obtain an evaporation of 1.7 cubic ins. per min.

A suitable working steam pressure would be about 50 to 55 lbs. per sq. in., which would give 378 times the volume of the water as steam, namely, $1.7 \times 378 = 642$ cu. ins. per min., or allowing for losses, say 600 cu. ins. per min.

Having found the steaming capacity, the bore of cylinder was calculated; the stroke being already fixed by the scale of 28 ins., namely 1⅛".

Assuming 4 miles per hour, or a scale speed of 96 M. P. H. as maximum, and wheels being $3\frac{5}{16}$ ins. dia., they will revolve at 406 revolutions per minute, and this with a 1⅛" stroke will give a piston speed of 913 inches per min.

Consequently the area of each piston, would be, in order to use 600 cu. ins. of steam per min. $\frac{600}{913 \times 2} = .328$ sq. ins. if steam is taken throughout the stroke. An earlier "cut off" is however desirable, as this will effect the proportions of the valve gear, to be explained later.

Therefore assuming a minimum of 60 per cent cut off at full speed, area of piston becomes

$$\frac{.328 \times 10}{6} = .546 \text{ equivalent to } 27/32\text{" diam.}$$

A bore of $\frac{13}{16}$" has been adopted and the cylinder arranged to bore to ⅞" if found desirable.

From the well known tractive effort formula

$$T = \frac{D^2 \times S \times P \times .8}{W} \qquad \frac{\frac{13}{16}^2 \times 1\frac{1}{8} \times 55 \times .8}{3\frac{5}{16}}$$

The weight on drivers should be about 3.5 times the tractive effort to prevent excessive slipping of wheels thus giving 35 lbs. as required weight an drivers.

Boiler is provided with a 7/32" ball spring loaded safety valve, situated in the front sand box, as it was found impossible to make this fitting to scale. A dummy safety valve to correct scale is screwed in top of firebox, and acts as a filler screw. A superheater of $\frac{3}{16}$" drawn tubing is fitted, the saturated steam being led into a cast brass header, into which the tubes and steam pipes are brazed. This header together with the superheater elements may be removed from boiler by removing two screws holding the header to front tube plate.

A long running thread sleeve is fitted as connection between cylinders and steam pipes to allow of superheater being withdrawn through the smokebox. The barrel of boiler is of solid drawn brass tube No. 14 G. B. & S. Fire tubes, 7 in number, of ½" 20 G. B. S. brass, or copper, tube. Front tube plate and back head are bronze castings, while the fire box is built up of 20 G. sheet copper, well stayed with 10 G. copper stays screwed through bath plates and nutted at each end.

The Throttle Valve is a plain "pull out" plug, the throttle box being cast integral with steam dome base.

Frames are cut from ¼" thick cold rolled steel bar, the outline in general rather closely following the prototype. Pedestal wedges are not fitted however, such being unnecessary in a model of this size.

Spring Rigging and equalizers are omitted, but spiral springs are fitted under each driver.

Trailer Truck is a brass casting very similar to the original, the journal boxes being provided with hidden spiral springs. The frame and engine weight bears on a spherical seat and cup attached to side limbs of truck casting, while the reaction is taken up by a hanger, whose ends are attached to a leaf spring (bolted to top of frame) and a horn cast on truck frame.

Engine Truck is made with cast brass side and transverse frames, the latter carrying a sliding bolster, which in turn pivots on center pin casting, bolted to underside of cylinder saddle.

Cylinders are cast in two pieces in brass, bolted along vertical center face, and to frames by means of screws put through from inside.

The Steam Chest is bored plain right through, and into it is pressed a valve bushing or sleeve which has the ports cut into it.

The Ports to cylinder are drilled to meet those cut in sleeve. The piston valve is a plain plug type, of cast iron, or phosphor bronze. (Note if the lapping of valve in sleeve is done cold, the valve should be made an easy fit in sleeve, to prevent tight running when hot.)

The Boiler is bolted to the cylinder saddle by the smokebox, while firebox end is carried on an angle bracket heel to a cross rail. The holes for holding down screws are slotted to permit of expansion of boiler. **The grate** is built up of strip steel, placed on edge with spacing washers and rivetted together to make one piece.

Ashpan is made up of sheet material, the front end being flanged at top, which flange rests on back edge of cross rail furnace bracer. The back of ashpan is attached to the extension of back head plate of boiler by two screws. By this means the ashpan is readily removed, if necessary after taking out the trailing truck.

The grate is supported by means of two rods passing through lugs held to foundation ring by brass screws. To remove the grate, pull out the two rods, slack the screws of lugs on one side, to allow of them being turned up. The space between bottom of foundation ring and top of ashpan is then clear, enabling the grate to be withdrawn sideways.

The cab roof is made to slide off, also the sliding ventilator is made use of for access to throttle lever. An extension handle is placed on throttle lever, to facilitate operation, without taking whole roof off.

Boiler Fittings consist of single cock water glass, blower valve; one water level cock, pressure gauge, and feed check valve.

Bell, headlight, generator and air pump are dummy, but headlight case may be fitted with an electric "pea" lamp.

Tender follows orthodox practice in general, and consists of trucks, frames and tank. Truck frames are castings, wheels of steel, same dimensions as engine truck wheels. Springs are dummies under bolster, but spiral springs are fitted to ends of equalizers which are soldered to journal boxes. This gives a good appearance without the large amount of work that would be required, if the original were too closely followed.

Tender Frame is built up of angle brass and a wood flooring placed over. The tank is held in place by four screws tapped into bars soldered, or revitted, to bottom of tank.

A Hand Force Pump is provided for boiler feed.

The following list gives this model locomotive's chief characteristics: Cylinders, $\frac{13}{16}$" bore × $1\frac{1}{8}$" stroke; Boiler Pressure, 55 lbs. per sq. in.; Diameter of Drivers, $3\frac{5}{16}$ ins.; Tractive Effort, 10 lbs.; Total Heating Surface, 170 sq. ins.; Superheater Surface, 27 sq. ins.; Grate Area, 14.25 sq. ins.; Weight on Drivers, approximately 35 lbs.; Estimated Run with Feed Shut Off, 15 mins.; Fuel, charcoal.

Lubrication is effected in following manner: from valve a small tube is taken up and out through the boiler barrel, down

the side and through a cylindrical tank, made to scale of the main air reservoir of prototype. This steam pipe goes to bottom of tank. From top of tank is led an oil supply pipe, which branches to each steam pipe just where they enter cylinder steam chests. The whole arrangement acts as a displacement lubricator and operates when throttle is open.

It will be noted that no stuffing boxes are fitted to valve spindle as steam is admitted on inside of valve, so that the long bearing for valve spindle is quite sufficient to take care of exhaust steam. This method entirely obviates friction of packing in ordinary stuffing boxes.

The piston rod has of course a flanged gland stuffing box.

Valve Gear: In reproducing the Wahscheart gear to a small scale a number of points must be observed. Being an outside gear too great a departure from the prototype would not be permissible, also too much lap to valve is not desirable, yet the more lap valve has, the greater the distance between valve stem pin and radius rod pin in combination lever, and greater room for pins.

The combination lever has three pin positions; the top one being connected to radius rod, middle one to valve spindle crosshead and bottom one to the anchor link carried by crosshead.

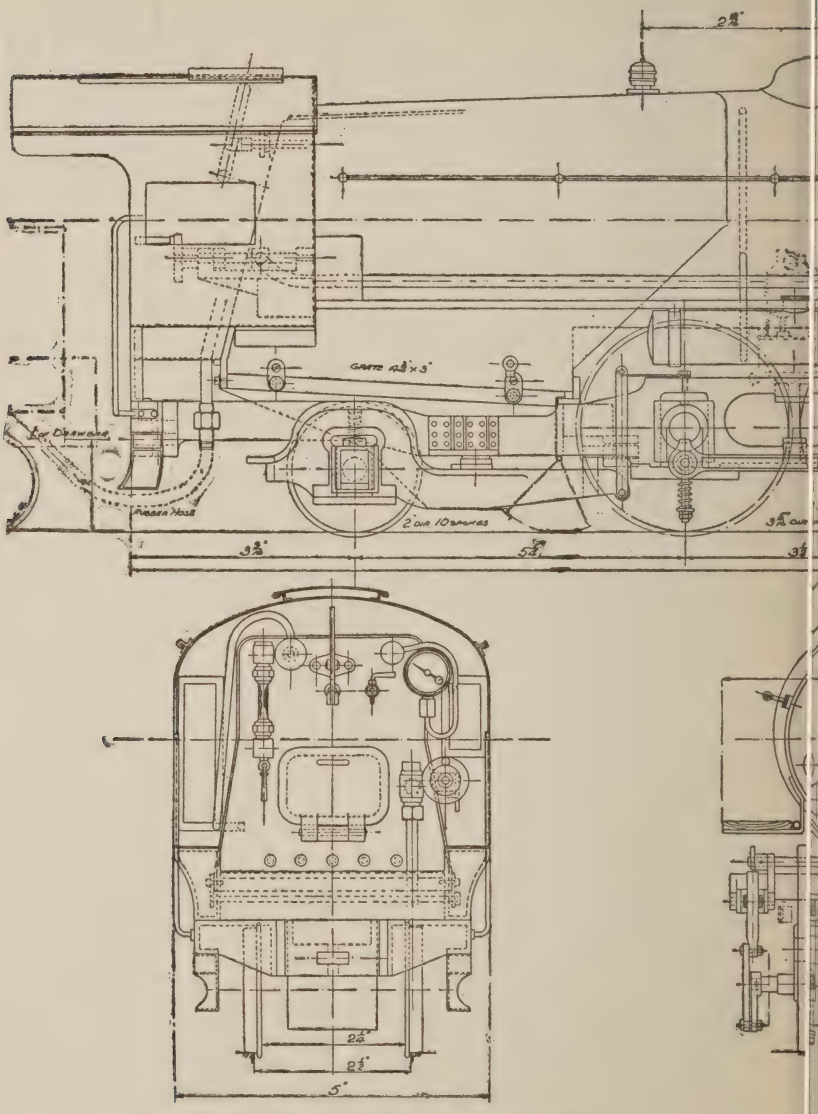
The position of these pins are such that the distance between top and middle pin bears the same relation to the distance between top and bottom pin that twice the sum of lap and lead does to piston stroke.

The expansion link is of length sufficient to give quarter inch travel of valve when radius rod is top or bottom of slot. The link swings approximately 45 degrees each side of center line, while the lower pin connected to the eccentric rod is close to center line of engine.

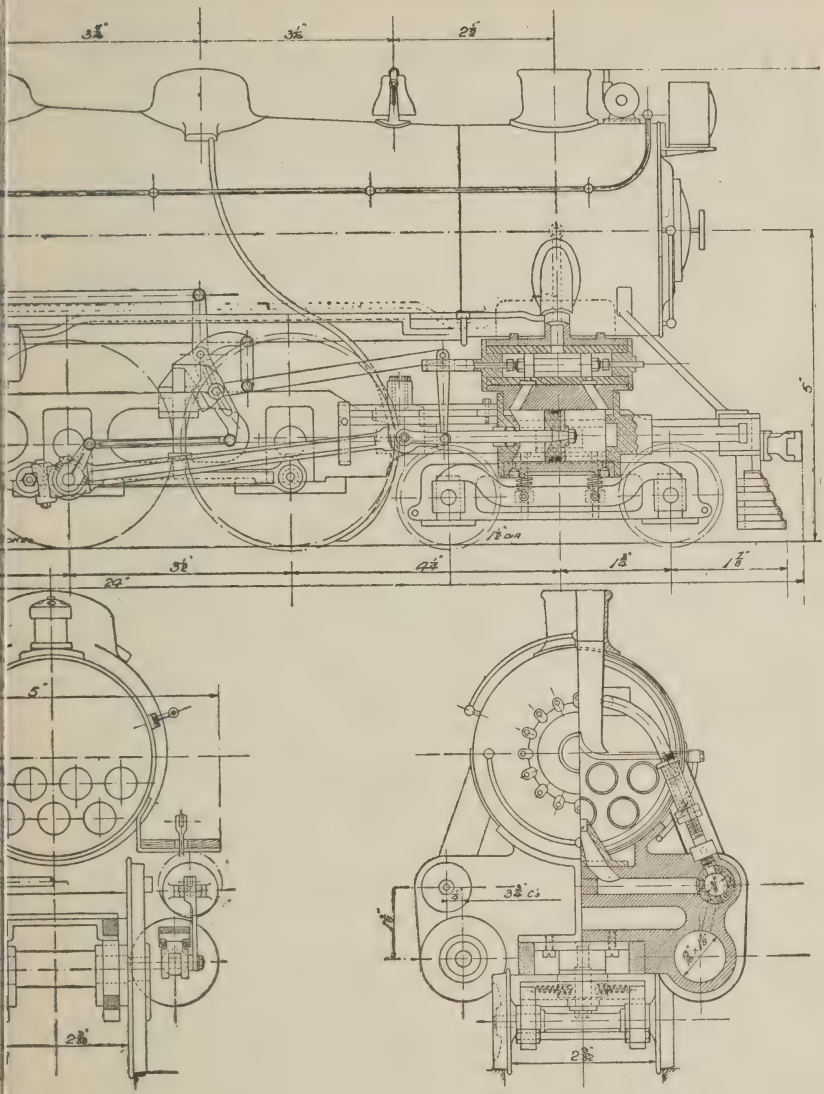
Reversing is effected by screw in cab.

The Triplex is a Universal Machine well adapted for all kinds of model and experimental work or Vocational Schools. It represents a complete equipment requiring but one quarter the space occupied by other types of machines able to perform the same variety of work. Some idea of its versatility may be gathered from the following work it will do; turning and boring; horizontal, angular and vertical milling; internal and external thread cutting; vertical, horizontal and angular drilling; drilling on the base. Spindle bearings are tapered and adjustable, of phosphor bronze. Gears are of steel. Spindle and tail stock of alloy steel, hardened and accurately ground. All feed screws are provided with micrometer dials for precision adjustment. Six spindle feeds forward and reverse, ranging from 90 to 1050 r.p.m., these speed changes can be made instantly. The operating power is geared motor drive, current can be obtained from the ordinary electric light socket.

The Precision Magnifying Mirror is a handy little tool, with a powerful lens 2 3/16″ in diam. It magnifies up to 7 inches without the slightest distortion and reflects a clean white light. It can be adjusted to any angle and is made to fit into a surface gauge or other instrument when you want to use it for laying out work. The Modelmaker will find it exceedingly useful in his work.



½" Scale Model Pennsylvania R. R. Locomotive
K 4 s Class.



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NEWS ITEMS

Mr. J. A. Joslin paid us a short visit on his way to England. He reports that the members of the Canadian Model Engineering Club are working hard on a number of Models which they intend to exhibit this fall at the Canadian National Exhibition. He hopes to arrange with an Agent in England to purchase and ship Model supplies direct to their members and friends as they cannot obtain such material in Canada. In his absence Mr. Harry B. Cox, 122 Pacific Avenue, Toronto, Ontario, Canada, is Acting Secretary. All of our Canadian readers should get in touch with this gentleman and find out all about their Club. Please enclose a stamped and addressed envelope when writing.

Everyone of our readers can help to boost American Modelmaking. Talk it up among your friends. If within reasonable distance of a Model Engineers' Club get in touch with the Secretary and find out where they meet, what their program is for the year and what are the dues. The success of Modelmaking will be greatly helped by the increased membership in the existing Societies. Ask the Secretary if he has the names and addresses of any other enthusiasts in your town. He may know of others, then get acquainted. See the January issue of the MODELMAKER for the list of Model Engineer Clubs. We shall be glad to receive corrected addresses, also address of Secretaries of Clubs not listed. Don't forget to enclose a stamped and addressed envelope when writing for information.

One branch of Modelmaking that has become deservedly popular in the past few years is the construction of scale models of famous old sailing vessels; war ships and merchantmen. In the last half century many such vessels were built; some of these having remarkable sailing records to their credit. Quite a few of the best known of these old timers were the product of our Down East Shipyards; many came from English and Scotch yards and a number were of French construction. The writer when a lad has many times stood on the Greenwich Observatory Hill and looked out over the "Pool" at the "forest of masts" in the docks stretching for miles down the opposite bank of the river Thames. Amongst that vast array of sailing vessels he has seen old East Indiamen, Tea Clippers, barques, square-riggers, and big fore-and-afters, including a few of the old "Wooden Walls" of the British Navy. It was a treat to wander through the docks and admire the East Indiamen with her ornate stern windows and balcony or the beautiful lines, tall tapering spars and figure heads of some of those famous "Windjammers." Most of these old timers have passed out.

The Modelmaker who faithfully reproduces a miniature one of those beautiful old vessels is helping to perpetuate what has become almost a lost art. On one of the writers trips to England—about seven days out—early in the morning we sighted a big bark hull down off our port bow; just a dim cloud of white canvas on the horizon. By midday she was off our port beam with everything up she could carry. It was a large iron bark, one of the Australian wool clippers, homeward bound. With glasses we could easily see part of her red underbody and the white foam at her bow as she heeled under the pressure of the breeze. Late that afternoon she had dropped astern, but was still "cracking on," her great spread of billowing white canvas illumined by the glorious lights from the setting sun. No modern steamer ever made such a beautiful picture. Dr. Karl Vogel of New York is building one of these fine models.

The new number of The C. S. M. E. Journal, Vol. 3, No. 1, has just come to hand. It contains the following interesting articles: A Model Traction Engine; Combustion and Fuels for Models; Three Cylinder Locomotives; Publicity on Model Engineering. Send a stamped and addressed envelope to Mr. H. M. Schlader, 2608 Magnolia Avenue, Chicago, Ill., and ask for a copy. The Chicago Society of Model Engineers is a wide awake organization. The members are now planning for the Annual Exhibition of Models. Ask for particulars of membership.

WHY NOT

There are many men residing in or near New York who have made models or are now interested in that delightful pastime. Is it not possible to get these enthusiasts together in the fall and have an exhibition of their Work. We would like to receive comments or suggestions from our readers. Write to The Modelmaker.

NEWS ITEMS

Mr. H. C. Field, 323 Ontario St., Windsor, Ontario, Canada, Secretary of The Detroit Model Yacht Club informs us that the Interlake Yachting Association will hold their Annual Meet at Put-in-Bay, Ohio, and that they have arranged for a series of races for Model Sail and Power Boats, under the supervision of the above club using their Rating and Racing Rules. The races will be held on July 13, 14, 15. The events will include:—Sailing Yachts class "C". Sailing Yachts free for all. Power Boats—1 in. piston displacement, saturated steam, displacement type hull; also a free for all Power Boats, any kind or type. Suitable prizes have been offered for the winners of these four events. The only restriction is that all competitors must belong to the Interlake Yachting Association or be members in good standing of any Club officially recognized by the Model Yacht Racing Association of America.

These competitions will no doubt do much to increase the interest and development of American built Model Sail and Power Boats.

The Detroit Club has increased its membership very much, largely due to the number of races successfully run off during the season of 1923. We realize New York is a long way from the scene of action, which will prevent our local enthusiasts entering their boats, but we hope there will be a big list of competitors and that weather conditions will be favorable for a successful meet.

Model boat enthusiasts residing within a reasonable distance from Detroit should write to Mr. Field and find out all about his real live organization. Then sign on.

We would be glad to hear from the Secretaries of the following: Philadelphia Model Yacht Club, San Francisco Model Yacht Club, if these are still in existence.

Mr. F. D. Grimke has completed the designs for working models of a 1¾" gauge Atlantic Type Locomotive, also an 0 gauge locomotive. He intends to build these models from raw material without making castings as he believes by this method he can considerably reduce the cost of the Models. He would like to hear from any reader who can supply fittings for the above gauges. Address him c/o THE MODELMAKER.

At a later date we hope to publish in THE MODELMAKER details and particulars of Mr. Grimke's work.

Mr. J. B. Retallack has given us a photo of a fine Loco he has built from a set of English castings. He made quite some changes in the original design to make it conform to American practice. It is ½" scale—4-6-2, with Walchaert Valve gear. He has had it under steam and it works perfectly. It is for sale. For further particulars and price, write to THE MODELMAKER.

Mr. J. E. Carrington recently moved into his new house. He has made provision for a workshop in the basement where we hope he will spend many a profitable hour with his Models.

The Model Engineer numbers for May and June contain the following leading articles: "The Aquaplane," a new type of submersible, illus. Practical Notes on Buying and Using Wood Saws, illus. Our Workshop Problems Competition. The "C.-H." Electrical Locks, illus. First Principles of Lubrication, illus. Model Marine Engines, illus. An Experimental Water-cycle, illus. The Elements of Vice Work, illus. Cylinder Arrangement for a Three-cylinder Model Locomotive, illus. A Model Light Cruiser, illus. A Model Gas Engine, illus. "Joy" Type Reversing Motions, illus. Pattern Making, illus. Descriptions of Model Exhibitions, Locomotive Notes, Correspondence, etc., etc.

We have just received a very appreciative letter from Mr. Ashley of The American Model Locomotive Co. in which he expresses his surprise at the number of letters he has recently received from the readers of THE MODELMAKER. "We did not realize," he writes, "that there were so many Modelmakers in the U. S. or we should have pushed our work much faster, you know it takes time to make patterns and get out good castings." He reports they are working on the development of a new Model Switching Locomotive with electric drive. We wish him every success with his new Model.

Mr. Douglas Getty reports quite an active demand for castings and blue prints of his three sizes of Model Locomotives. These are of American design, This is the third American firm who are doing their best to fill the ever increasing demand for American made Model Locomotives. We hope our readers will give these firms the patronage and support they deserve.

NEWS ITEMS

A very practical tool for cutting circular holes in the heaviest of sheet metals hast just been put on the market by the Gerold Company. The BOROLE has shank to fit in carpenter's brace and is drop forged from the best grade of tool steel, properly hardened, so that it will stand up under the severest usage. It will cut 9 different sized holes, from ¾" to 2¾" diameter, advancing by quarter inches, merely by shifting pilot pin from one hole to another in the tool. The BOROLE solves the problem of quickly and cleanly cutting holes in sheet metal, hard rubber, slate, fibre, etc. As its weight is only four ounces it is the ideal tool for the kit of the plumber, electrician, garage mechanic, radio workers, sheet metal workers, and for the modelmakers.

Mr. H. J. Coventry can now supply complete sets of blue prints of the two sizes of his P. R. R. K 4 S Locomotive. There are 59 sheets of drawings for the ½" scale; and 45 sheets for the ¾" scale, all fully dimensioned. They are both very fine sets. He is at work on the patterns and hopes to be able to supply sets of castings in the near future.

The Gerold Company inform us they have placed a number of the Wade Bench Lathes and that they have received some very gratifying letters from customers who write they are well satisfied with the work they have been able to do on this lathe. The Leading Jewelry Supply Houses have shown their approval by stocking this lathe and recommending it as just the tool for watchmakers and working jewelers.

BOOK REVIEWS

Locomotive Valve Gears and Valve Setting, 159 pages, 71 illus. and 23 plates, 8½ x 5½ in., cloth, $2.00.

A practical handbook arranged under the following headings. The slide valve; piston valves; eccentric and reversing gear, Stephenson's link motion, Gooch and Allen link motions; Walschaert's valve gear; Joy's valve gear, other types of valve gear, valve gearing for locomotives having more than two cylinders, concluding with chapters on valve setting and valve diagrams. A number of the plates illustrate different types of engines with their respective valve gears.

BOOK REVIEWS

Model Railways, their design, details and practical construction, by Henry Greenly. 315 pages, 399 photos, diagrams and illustrations, 8¼ x 5½ in., cloth, $2.50.

This work contains much of interest to our readers, carefully arranged under the following headings: Types of Railways, planning railways, points and crossings, permanent way material, laying track, making various types of signals, signal operation, examples of bridges, station building, locomotive sheds and signal boxes, construction of rolling stock, index. The numerous illustrations add greatly to the value of the work. Mr. Greenly has added another classic to the literature on Model Railway Engineering.

Rotary and Other Converters, by W. S. Ibbetson, 171 pages, 49 illustrations, 8¾ x 5¾ in., cloth, $2.25.

Being a practical handbook for Sub-Station Attendants. It includes brief explanations of those fundamental principles which must be understood before the actions of the various types of converters can be fully comprehended.

The Elements of Automatic Telephony, by Arthur Crotch, 80 pages, 42 illus., 8¾ x 5½ in., cloth, $1.05.

This is an English book dealing with their three principle systems. The Automatic Telephone Company, the Siemens, and the Relay Automatic Company. It is intended as an introduction to practical working knowledge for the use of operators. Although it treats of foreign practice it may prove of interest to American operators.

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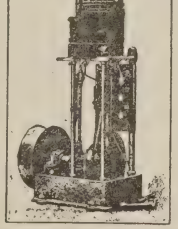

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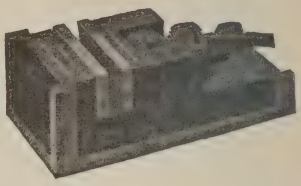

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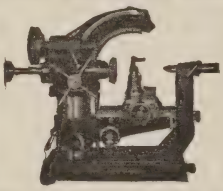

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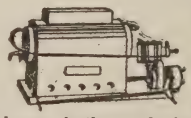

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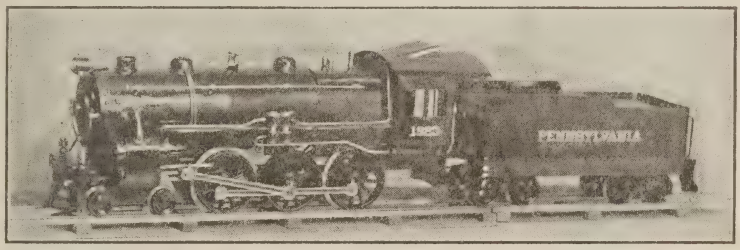

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OUR FOREWORD

A 30-LEVER INTERLOCKING SWITCH AND SIGNAL TOWER FRAME

By Oliver W. Wilson

One of the first difficulties of major importance that most model railroad enthusiasts come up against is the positive and accurate control of his switch system. As most of us who work in small gauges tend to have rather complicated layouts, this can become quite a means of delay in the completion of the roadbed. The writer has an "O" gauge line in an attic, which, with the aid of a fellow lover of models and a lifelong chum, Mr. T. E. R. Singer by name, has more or less been completed. That is, the purely mechanical end. Scenery is still in the evolutionary stage

Between us, we have devised many and various schemes of switch control, both mechanical and electrical; none of which were really satisfactory. Either they were not reliable or else so delicate and difficult of manufacture that we would never finish the line if they were used.

At last the writer, during a temporary confinement at home caused by sickness, got his drafting materials out, and developed a mechanical interlocking frame that fulfilled the following requirements:—

1. All the parts had to be made out of square brass, brass rodding, wood and sheet brass.
2. There was to be no soldering.
3. Everything was to be rigid, especially the bearings.
4. It **must** be strong in construction.

This means that accurate scale had at once to be dropped although when the frame is enclosed in a proper signal box this will not be so noticeable.

The frame consists of thirty levers, three only being spares. This is thus quite a respectable sized signal box and the interlocking diagram alone took several days to work out.

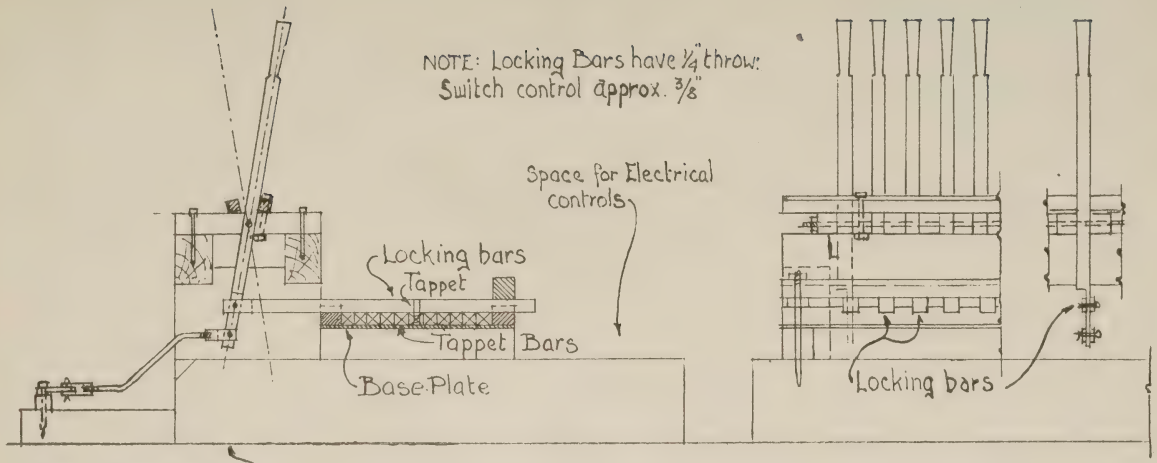
The frame was built upon a piece of ⅞″ pine board and not until it was finished was it screwed down upon the main baseboard of the track. Upon this two end pieces of wood are fastened which support the two longitudinal beams that form the frame. Upon these beams rest the bearings that alternate with the levers. These consist of short lengths of 3/16″ square brass, every third one being bolted to the beams. The levers are ⅛″ square brass 3″ long with the handles filed to shape and the lower ends made narrower so that they will fit into the forked ends of the locking bars and the point rod bars.

If I had to make this frame again I would obtain small brass angles for the beams as I think they would make a firmer frame. I was unable at the time to do so, and had to resort to wood.

The interlocking frame consists of a base plate of heavy sheet brass resting at intervals on cross pieces of wood. This plate is exactly ⅜″ plus ⅛″ times the number of tappet bars required, wide. As there are eleven bars in this case, the frame is 1¾″ wide. The locking bars rest or slide in two grooved bars filed out of 3/16″ brass (which by the way was the dirtiest job of all and made my hand very sore); and are directly above the tappet bars. These bars have little brass tappets screwed into them where required and these engage grooves filed into the sides of the interlocking bars. As all this was worked out on paper beforehand the parts were made all at once and the whole frame assembled in one process.

When all the bars and levers were in place and engaging with the locking perfectly the locking frame was permanently fastened down by an extra bar of 3/16″ brass which can be removed if necessary, thus enabling repairs or adjustments to be made to the frame.

The last and most puzzling problem of all was the question of holding the levers in their proper place. To prevent them being pulled too far one way or the other certain levers were locked and ⅛″ bars were pressed against them and then


NOTE: Locking Bars have 1/4" throw.
Switch control approx. 3/8"
Space for Electrical controls
Locking bars
Tappet
Tappet Bars
Base Plate
Locking bars
Level of Baseboard
"O" - GUAGE - SIGNAL - FRAME -
1 3/4 1/2 0 1/2 1 2 3 4
- Scale in Inches -

- Oliver W. Wilson -

bolted into place. This was a very rough and ready method and not to be followed I hope by any who may build frames suggested by this one. As to the levers staying in place friction and the locking are sufficient in this case. Mr. Greenly's latest book on Model Railways suggests some ideas. So far I have not fitted any onto this frame. However, each lever has a small rod screwed into it which could be used for some catch that would hold it in position till released.

Unfortunately I have not had time to fit up more than three switches to the frame but after some months they are working very well and cause no derailments. A few signals are ready to be fastened and I hope to be able to get them working fairly soon. At a later date I shall submit a plan of the station and with it a locking layout.

For the threading of the bolts I use the smallest taps and dies— 1 x 72 A. S. M. E.

With the levers painted their correct colors, the frame looks quite workmanlike with the rest of it in shining brass. Some time I hope to get a photograph of it which could be used for publication.

½" SCALE SWITCHER LOCOMOTIVE STEAM AND ELECTRIC DRIVE

By Roy Ashley

The Steam Switcher was built exactly to scale from the Railroad Co.'s drawings and every part wherever possible was cast from brass patterns. All cast parts are fully detailed as in the original.

This method of construction greatly adds to the appearance of the finished Model, and reduces the amount of labor.

Several months were spent, experimenting with a satisfactory gasolene burner. Finally a burner was developed that would give an intense heat, or would throttle down to a slow heat. The main difficulty was to design a burner that would fit a narrow type of firebox, and still have sufficient combustion space.

The burner is of the generator type, that is, the gasolene is preheated in a tube passing over the burner discs. The fuel is carried in the tender under pressure, and is controlled by a needle valve in the cab. About one-third of the tender tank is a receptacle for the fuel, the balance of the tank contains water, with hand pump.

The cylinders are made up of three parts, 1 cylinder block, 2 valve chest, 3 valve chest cover and steam pipe connection. This method of construction gives the cylinder the appearance of a piston valve cylinder, but is really a "D" valve.

The valve gear is the full Walscheart gear, with no modifications, with links designed so that the radius can be cut in the lathe.

The operation of the steam Switcher was very interesting and certainly exciting, for with 90 to 120 lbs. pressure, and superheated steam it keeps one busy tending it, and for this reason the Electric Switcher was built.

For a working model railway, with freight and passenger trains, automatic block systems, etc., the electrically driven locomotive is ideal.

The electric switcher is driven by a standard motor, using 40 or 50 volts D.C. placed in the front end of the tender. The drive is obtained through a flexible spring coupling to an 8 to 1 helical reduction gear on the back axle of the loco. These gears run in oil, in a cast brass housing, split four ways and screwed together. The helical gears enable the loco. to coast when the current is shut off.

In the rear end of the tender is placed the permanent magnet motor reversing switch, which allows the loco. to be reversed from the controlling switch.

Collector shoes are placed on both back and front tender trucks, which allows the collection of current when the third rail is cut to permit the crossing of other tracks.

The electric Switcher has an equalized spring rigging, with laminated springs over the drivers. The construction of laminated springs is usually looked upon by Model Makers as a very tedious job, but this is not so, they are well worth the time spent on them, and they give wonderful results. The most difficult part to make is the rectangular steel collar which holds the laminations together. This is best accomplished by laying off as many collars that are needed, on a bar of cold rolled steel, then drill out the inside of collar, and file to size, then cut off and file the outside.

Clock spring is no good for making laminated springs, the best material, for ½" scale, is semi-hard spring steel .038" thick and 5/32" wide.

When the collars are filed to size, a hole about 1/16" is drilled offset

down to clear the inside wall of the collar, then enough pieces of spring steel are cut extra long, and placed in the vise, and a groove is filed across them deep enough to admit a 1/16" round wire.

The laminations are then placed in the collar, the groove in line with the drilled hole, and the wire rivet put in and riveted over. The whole assembly is then placed in the vise, and filed to the shape of a loco. spring.

The spring steel mentioned can be filed with ease. The design for the automatic couplers was taken from a scale model 3" to the foot Climax coupler.

Couplers are easily constructed by making a special counterbore, having a long guide about ¼" below the cutting edge. The knuckle pin hole is drilled and then counterbored, from the inside of the two halves of the coupler, to accomodate the knuckle. The knuckle is then counterbored to fit. The two halves of the coupler are soldered together, and knuckle placed in and riveted.

1¾" GAUGE ATLANTIC TYPE LOCOMOTIVE

By Frederick Drayton Grimke

This locomotive, as previously mentioned in the Modelmaker is by this time, well under construction and at the end of September will be complete except for the boiler and general fittings.

The main features of this locomotive are: Total length (including tender), 27 in.; Width (over all), 4¼ in.; Height (over all), 5⅞ in.; Wheel base (rigid), 3 in.; Wheel base (total), 11⅜ in. approx.; Boiler (over all, length), 13 5/16 in.; Boiler (diameter), 3 in.; Fire Tubes (½ in. diameter), 6 in.; Grate Area, 10.07 sq. in.; Heating Surface, 89.04 sq. in. approx.; Water Capacity, 50 cu. in.; Working Pressure (steam), 50 to 60 lbs.; Bore of cylinder, ½ in.; Stroke of piston, ¾ in.

The locomotive was not copied from any Prototype, but is a combination of a Rock Island and Pennsylvania, Atlantic type.

This was due to the fact that my partner and I had to build the locomotive to suit the wheels we had. We spaced the wheels as to what we estimated most suited to our needs and found out by calculations that we were within the scale limits of the two locomotives mentioned above.

Following the Pennsylvania Railroad Practice, the left hand crank leads. We are using piston valves with inside admission, and Walschaert Valve Gear minus the lap and lead lever.

With the exception of the wheels, which are castings, the engine is made entirely from raw material, brass, bronze, steel and iron. Material that can be purchased at any tool supply house.

Later on we shall be glad to contribute an illustrated article to The Modelmaker and also to supply finished locomotives or complete sets of materials with drawings.

The ten model steel-type high capacity gondola cars which Arthur W. Line is building for Capt. G. F. Vollmer's 1¼ in. gauge railway are nearing completion. Particular attention has been paid to the running gear and two styles of 6-wheel truck and a cast-steel archbar style of 4-wheel truck have been specially designed for these cars. The wheels and truck parts are white metal diecastings. The wheels are pressed on heavy steel axles and are of substantial and improved design. All trucks are flexible and have good riding and track-keeping qualities. There are three sizes of bodies for the ten cars, eight of the bodies being alike except for minor differences in end construction. Seven cars will be lettered for Canadian roads and three for U. S. roads and all will be fitted with dummy A.R.A. couplers. Upon completion the trucks and cars will be photographed for the Modelmaker. Mr. Line would be glad to hear from any of our readers who are in the market for wheels and truck frames.

It will interest our New York Modelmakers to know that one of the winning model power boats at the recent races at Put-in-Bay was built by the Model Machine Shop Co. of New York, for Mr. E. C. Chute. The "Pug" is 38 in. overall, 11 in. beam, mahogany planked, driven by a 3 cylinder poppet valve engine, ⅝ x ¾ with a water tube boiler. The engine runs at high speed and is credited with having made very fast time. This firm has just completed a boiler plant and 8 cylinder engine for a 6 foot model power boat for one of their customers.

THE CONSTRUCTION OF MODEL
MARINE STEAM ENGINES

By F. DRAYTON GRIMKE

A TWO CYLINDER DOUBLE-ACTING ENGINE, WITH REVERSING GEAR (⅝" BORE X ⅝" STROKE)

CHAPTER IV.

After having built a single cylinder Marine Engine, one naturally wishes to build a two cylinder Engine. The instructions and operations performed in constructing the single engine equally apply to the double cylinder engine.

The only parts needing description are the base, cylinder block, crank shaft, catch plate, motion rod, after bracket, after reverse lever, and lagging pieces: (see Figs. 1, 4, 7, 13, 59, 61, 62, 64, 65 and 67).

If, on the other hand, just a simple non-reversing engine be desired, Figs. 11, 12, 32, 33, 34, 36, 38, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, and 63 are omitted but two of Fig. 32, four each of Figs. 33 and 34 are required for obvious reasons.

Base. (Fig. 1). The bottom and ends are surfaced off smooth and true to each other, that is, the ends are parallel to each other and perpendicular to the bottom. This is accomplished by either one of the three methods previously mentioned. The reader can take his choice.

The bearing caps, three in number are cleaned up to fit the projections on the base. As each cap is finished and seated to its projection, it should be so marked to distinguish it from the others so that it will go back the same way it was originally fitted. The caps are clamped on and the cap bolt index centers are located $\frac{5}{16}$" from each side of the center line and midway on the face.

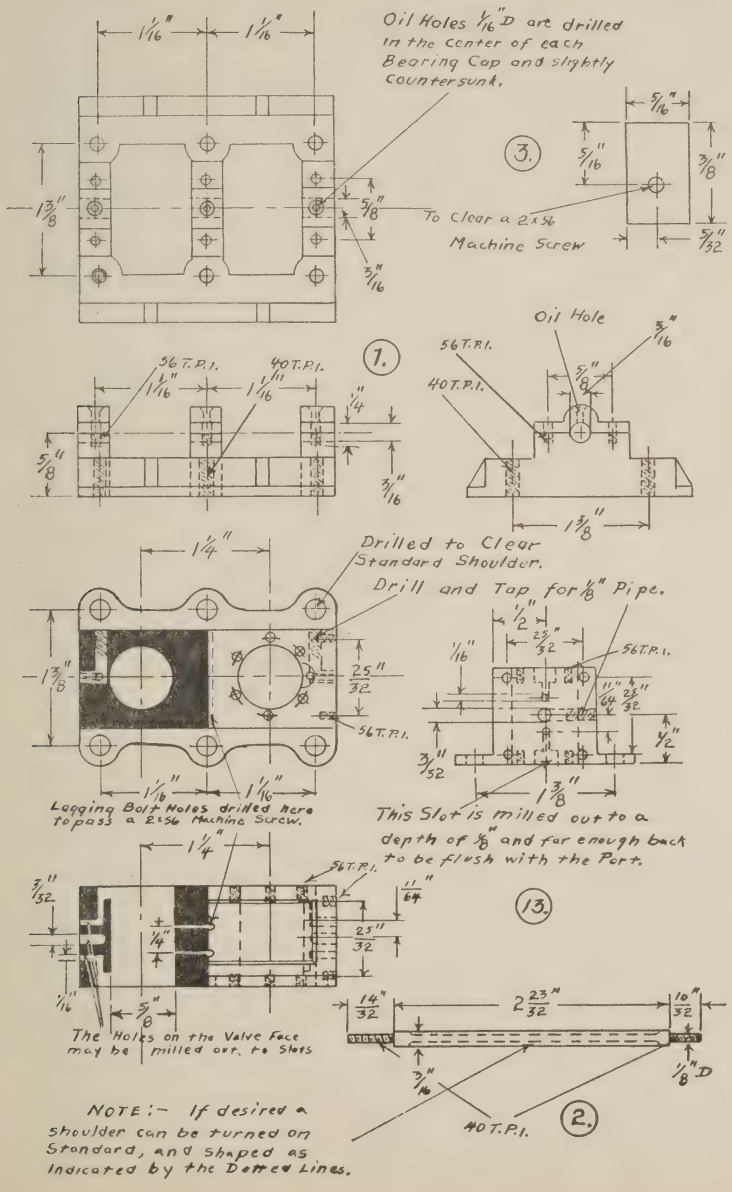
The bolt holes are drilled and tapped for a 2 x 56 ¼" round brass or steel machine screws as previously directed.

The center lines for the shaft are marked on each end of the base. The base is clamped in a vertical position on the drill table.

As previously explained, it is better to drill a guide hole first and then finish by using a drill of the proper diameter. The guide hole was drilled and finished to $\frac{7}{16}$" in diameter.

The drill is passed through the upper bearing and half way through the middle. Reverse the base and drill bearing as previously described. If the drilling is accurate all three holes will line up perfectly.

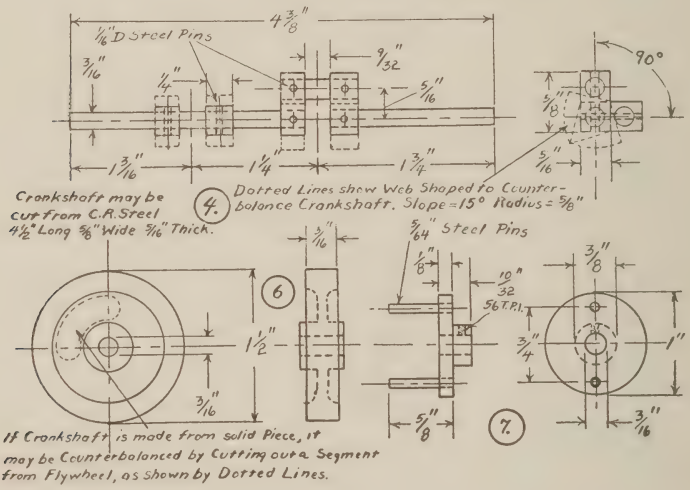
The reason why the shaft hole is not drilled at one setting of the base is as follows: Suppose the two ends were not


Oil Holes 1/16" D are drilled in the center of each Bearing Cap and slightly Countersunk.
1 1/16"
1 1/16"
1 3/8"
5/8"
3/16"
3.
5/16"
5/16"
3/8"
To Clear a 2 x 56 Machine Screw
5/32"
1.
56 T.P.I.
40 T.P.I.
1 1/16"
1 1/16"
1/4"
5/8"
3/16"
Oil Hole
3/16"
56 T.P.I.
40 T.P.I.
5/8"
1 3/8"
1 1/4"
Drilled to Clear Standard Shoulder.
Drill and Tap for 1/8" Pipe.
1 3/8"
25/32"
56 T.P.I.
1 1/16"
1 1/16"
Lagging Bolt Holes drilled here to pass a 2 x 56 Machine Screw.
1/2"
23/32"
56 T.P.I.
1/16"
11/64"
23/32"
1/2"
3/32"
1 3/8"
This Slot is milled out to a depth of 1/8" and far enough back to be flush with the Port.
1 1/4"
56 T.P.I.
3/32"
11/64"
13.
1/4"
25/32"
1/16"
5/8"
The Holes on the Valve Face may be milled out to Slots
14/32"
2 23/32"
10/32"
3/16"
1/8" D
40 T.P.I.
2.
NOTE:- If desired a Shoulder can be turned on Standard, and Shaped as indicated by the Dotted Lines.

exactly parallel, then the shaft center would form an angle with the true center, if all three bearings were drilled at the same time. A mistake of this kind is impossible to correct.

Where as when the shaft hole is drilled from opposite points to meet in the center, the chances are that the error in alignment would be minimized and this error can be corrected. Of course, if the ends are parallel, which they should be, it would make no difference whether the shaft holes were drilled all from one end of the base or from both ends.

When the guide holes have been drilled, the $\frac{3}{16}$" drill is used to bring the holes to size. The base does not have to be



reversed as the guide holes lead the drill. The holes are reamed to $\frac{3}{16}$" exact.

The standard holes are drilled and tapped by the method previously described. Oil holes should be drilled in the bearing caps as previously directed.

The Cylinder. (Fig. 13). The cylinder casting is cleaned up by either one of the methods previously described. The bottom and top are parallel to each other; the ends are parallel to each other and perpendicular to both the top and bottom.

A meridian line on the top is located and on this the centers of the cylinder are marked 1¼" from each other. Before any of the actual work is done, it is better to mark all the top and bottom cylinders, covers, bolt circles, the valve chest bolts, and all steam ports as has been explained in laying out the single cylinder marine engine.

The bore of the cylinder is ⅝". The bore can be easily

drilled in the drill press and afterwards reamed. It is better if the cylinders are bored in the lathe. The following method is used:

The cylinder casting is mounted on the independent jaw chuck, so that the center of one of the cord holes is as near the center of the lathe as possible. When this is done, the hole is bored out to several thousandths of an inch below 5/8". The bore must be parallel and not tapered sides.

The other bore is finished in the same manner. The cylinder is removed from the lathe and the bores reamed to 5/8" exact.

When all the steam ports are drilled, the casting should be mounted in its natural position in a milling machine vise. A 1/8", 3/8" or 1/4" end mill is inserted in the chuck of the machine and a small cavity is milled out to 1/8" depth far enough back that its inside edge lies flush with the edge of the steam port which lies furthest from the bore. This cavity is milled out where the steam ports come to the top and bottom of the cylinder castings.

The steam ports and exhaust ports on the valve face may be also milled out as previously directed.

Transversally across the cylinder and between the bore (there is room enough) two holes, 1/4" apart are drilled to clear a 2 x 56 machine screw. These holes are for the lagging bolts.

Crank Shaft. (Fig. 4). The crank shaft can be made in one of two ways, built up or cut and turned out from a piece of cold rolled steel of the proper width, thickness, but 1/2" to 3/4" longer than necessary. If the latter method is chosen, proceed as follows:

(To be continued)

We have received from Mr. Robert E. M. Bain photographs of two of his fine Models. The first is of a Pacific Type Locomotive 4—4—0. It is 6 ft. 7 in. overall, boiler 7½ in. diam., seamless tube, drivers 8¼ in., stroke 2½ in., bore 2 in. Stands 19 in. over the rails to stack, gauge 6½ in. We hope to be able to give a fuller description of this fine Model in a later issue. The other photograph shows a model of the S. S. Steamship New York. The construction of this model extended over a period of ten years. It is quite complete and was built along the lines and in the manner of a big ship. Lines laid, ribs bent, keel placed and ribs riveted to same, deck beams placed and the frame covered with strips of metal and then the holes for the ports were spaced and bored. The model is operated by a small sewing machine motor, operating both screws which revolve in opposite directions. The masts are hollow being of metal tapered. There are 78 blocks for the tackle. The deck fittings include derrick booms, ventilators and boats. The rudder is a Thompson Byles patent and moves slowly from side to side when the propellers are in motion. Besides these two models he has a number of others in his collection which he has built at different times.

Mr. F. A. Read, of Winnipeg, Canada writes us he has just received a large shipment of Model Locomotive Castings, cars and railway material. A full range of steam engines and boilers, nuts and bolts, and sundries for the Modelmaker. He will be glad to hear from any of our readers who are interested in such material.

Mr. G. B. Douglas recently sold one of his fine Model Ships to the Chicago Yacht Club. It will be offered as a trophy to be competed for in the forthcoming Yacht races. Two other of Mr. Douglas' Models were recently shipped to a purchaser on the West Coast.

INTER-LAKE YACHTING ASSOCIATION

Put-In-Bay

MODEL BOAT RACES

By H. C. FIELD

I hope the following information which you requested in your letter of August 1, will be of use to you. I was not able to get complete lists as the Secretary of the Inter-Lake Yachting Association is off on an extended cruise, but I can furnish you with the list of winners with a few of the entries.

SAIL BOATS

Class	Name of Boat	Owner	Club	Position
C	Peter Pan	Stevenson	D.M.Y.C.	1st
"	Embree	H. A. Miller	"	2nd
"	Peter Pan II	A. C. Stahl	"	3rd
"	Miss St. Clair	J. Rutherford	"	
"	———	G. Steinbrecher	"	
"	———	J. Lannen	"	
D	Spray	N. Taylor	"	
	———	Petts	"	
B	———	D. A. Steinle	Toledo Y.C.	

These are all the boats that I have been able to get the entries of. The winners of the class C race were the winners of the free for all. Part of the course was laid out in Lake Erie, and as there was a stiff breeze blowing some heavy seas were encountered so there was a lot of hard rowing done to keep up with the boats.

The two Peter Pans were raced without a topsail, the jib and mainsail only being used, they have somewhat of a vee bottom and are good sailors in light or heavy winds.

The Embree was Marconi rigged as all the boats were, except the above and has very fine lines, being somewhat of a shallower draft than the rest.

Miss St. Clair, Marconi rigged, is a line model of a class R boat and proved an excellent sailor in the heavy wind, but lacked the speed to get in front.

One description would cover the rest, they are of the usual model sail boat form—somewhat round in the bilge with the usual fin keel.

Mr. Steinle's boat carried a hollow spar which gave way under the strain of the heavy wind.

The course was a triangle, and according to the model yachtsmen was difficult, one flag being but twenty feet from a sand bar. This course was sailed three times, all boats sailing.

The above is all that I can remember of the sailboats.

The Gadfly is 40 ins. overall—10 ins. beam and has the same lines as Bluebird II (reduced). The hull is of mahogany—planked— and all seams battened—on 18 ribs—no less than 2,000 screws being used in the planking alone—30 planks not including deck (Bluebird II has the same number) with chine, sheer, and keel rabbetted. It has a two cylinder 27/32 bore x 7/8 stroke extremely high speed engine (6,450 R.P.M.). The boiler has 20 longitudinal water tube. The spray from a passing speed boat put the torch out just after it started so the race was run on reserve steam, the judge not allowing a second start. The real speed of the boat follows in a description of the club races just held which I am enclosing.

The Hawk is 44 ins. overall, 12 ins. beam, hull built of sheet metal, of runabout lines with heavy lift at front. 2 cylinder slide valve engine. The boiler has longitudinal water tubes.

The Greyhound and Firefly are 46 ins. overall and 12 ins. beam, hulls built of sheet metal, of runabout lines, with single cylinder d. a. slide valve engine 3/4 x 7/8 —water tube boiler.

Following are the results of the Club's 1 in. Piston Disp., Sat. Steam, Displacement Hull races for the D.M.Y.C. Trophy. This race is run in three heats and consists of five consecutive laps from a flying start not to exceed one lap—100 ft. dia. tethered course.

POWER BOATS

1 in. Piston Disp., Sat. Steam, Displacement type hull.

Name of Boat	Owner	Club	Time Min.	Time Sec.	Position
Bluebird II	S. E. Field	D.Y.M.C.	0.	53	1st
Pug	E. C. Chute	"	0.	56	2nd
Gadfly	H. C. Field	"	1.	03	3rd
Hawk	F. F. Field	"			
Greyhound	———	———			
Firefly	———	———			

As all the boats present measured into the above class the free for all was not run, prizes being given as above. The course was the usual 100 feet dia. tethered. The race consisted of three laps (consecutive) from a flying start. Originally it was five laps, but the Inter-Lake judge changed it to three.

The Bluebird II is 44 ins. overall—11 ins. beam, the hull is of mahogany, planked on 18 ribs, ash keel, and is of very fine lines. It has a two cylinder poppet valve extremely high speed engine (6,200 R.P.M.) 13/16 x 7/8. The boiler has longitudinal water tubes 20 in number. Usual blow torch.

The Pug is 38 ins. overall—11 ins. beam, mahogany planked, hardwood keel, of good lines. It has a three cylinder poppet valve engine 5/8 x 3/4. The boiler has 3/8 dia. U tubes the delivery end of same being into a steam drum along the top of the boiler.

Boat	Owner	Total Time Min.	Sec.	Fastest Lap	Position
	Race of August 3rd				
Gadfly	H. C. Field	1.	16.1	13 sec.	1st
Bluebird II	S. E. Field	1.	27	15 sec.	2nd
Pug	E. C. Chute	1.	22	14.2 (only run 3 laps)	3rd
	Race of August 17				
Gadfly	H. C. Field	1.	5.2	10.9 sec	1st
Bluebird II	S. E. Field	2.	1	13.9 sec.	2nd
Pug	E. C. Chute	1.	34	15.7 (only run 3 laps)	3rd
	Race of August 24				
Gadfly	H. C. Field	1.	9	10 sec.	1st
Bluebird II	S. E. Field	2.	3	13.1 sec.	2nd
Hawk	F. F. Field	2.	59	19 sec.	3rd

After the last heat the Gadfly was tuned up for an endurance test which it performed in first rate style running off 32 laps without stopping, at an average rate of speed of 17½ miles per hour. Her speed of nearly 22 miles per hour official time, constitutes a new speed record for that particular type of boat I think. While at Put-in-Bay I had a conversation with Mr. Gar Wood of International Motor Boat Fame and he was very much interested in the model boats and he is going to offer two cups—one for hydroplanes and one for displacement boats for inter-club competition. Just as soon as I can get full particulars as to engine size (which I understand was 1 cu. in.) and the deed of gift I will forward same to you.

I must thank you for the aid given us and the publicity for the Race at Inter-Lake Meet at Put-in-Bay and wish you and your Magazine every success possible.

Have you seen the New York Central Railway's Exhibition of Model Locomotives, cars, and equipment. It is open every day and is free to all. It is located in the East end gallery in the Main Hall of the Grand Central Depot at 42nd Street, New York. A special feature of this exhibit is the original DeWitt Clinton Locomotive and coaches, which constituted the first New York City Railway train. There is also the unique collection of working Locomotive Models made by Mr. Warther; a model of the New York Central Electric Locomotive and some freight cars built by Mr. Arthur W. Line. Also many photos, drawings, and statistical data relating to railway, car and locomotive construction, track, signals, and maintenance work. Every one of our readers interested in Model Railway work could spend an hour in this exhibit very profitably.

The Ship Model Society, whose members are interested in collecting miniature reproductions of old time sailing vessels, is planning an exhibition here next Winter. The society would be glad to hear from anyone possessing such models. Information regarding the exhibition can be obtained from Henry B. Culver, secretary, No. 38 West Forty-fourth Street, New York.

We have just had a very pleasant visit from Mr. E. B. Tolsted of Chicago on his return from a trip to England. In London he met Mr. J. A. Joslin, Sec. of the Toronto Society of Model Engineers, Mr. R. I. Lee, of Minneapolis, and Mr. J. T. Lozier of New York. These American Model Enthusiasts had a great time together for a few days. Mr. Tolsted and Mr. Joslin as guests of The London Society of Model Engineers visited the Locomotives Shops at

PENNSYLVANIA RAILROAD PASSENGER LOCOMOTIVE

By N. D. Weaver

I am enclosing a photograph of a locomotive which I built for use in a Christmas display last year.

It is designed from the general elevation drawing of the Pennsylvania Railroad, class G5s passenger locomotive, and is made to scale of 7/16", 2" gauge.

The boiler, cab and tender body are made of sheet metal securely soldered, brass escutcheon pins being used for immitation rivets. The cylinder saddle is made of sheet brass, two pieces being properly shaped and drilled, after which the cylinder and steam chests, made of brass tube were fitted into the saddle pieces and soldered, brass caps were turned up and fitted on the ends of the cylinders to represent cylinder head castings after wihch a jacket of sheet copper was soldered on making a solid and realistic looking cylinder and saddle.

The engine truck wheels are 1⅛" diam., driving wheels 2⅝" diam., and tender truck wheels 1⅜" diam. The overall dimensions are: length 32", width 4½", height 6½" and weighs about 14 lbs. The head light contains a 21 volt globe, and inside of cab is a connection for attaching cord for car lighting During the run at Christmas time the locomotive handled 7 cars with ease and the way it worked it could possibly pull that many more.

The locomotive is fitted with an electric motor purchased from Bouch Bouher Inc. of New York, and operates very well on 14-19 and 27 volts through a transformer. Reverse lever is fitted in cab.

On account of being pressed for time during construction, the Walschaert valve gear was not included as you will note on photo, but I expect to have this applied and also make a few other alterations before the next holiday season, and would be glad to send you a new photo when completed.

The South Bend Lathe Works, an old and reliable concern manufacture some lathes which will appeal to Modelmakers. When you are in the market write for their list before you make your decision. State your needs when writing for particulars.

Mr. James Campbell informs us he is building a Model U. S. Destroyer to ⅛" scale. He is using sheet brass and zinc as the principal materials.

In the August issue of **Junior Mechanics** we see a notice to the effect that the name of this paper will be changed to **"The Mechanical Boy"** commencing with September 4th and after that date it will be issued every week, price 14 cents per copy. From a perusal of a circular just to hand it will endeavor to cover a very broad field including such subjects as Engineering and science; Working Models and Radio; Scientific Experiment; Motoring, Cycling; Photography; amusing tricks; puzzles and competitions, wholesome fiction and fun, etc., all written in a popular manner intended to appeal to boys of all ages.

We are very sorry to see our little friend the **Junior Mechanics** passing into the "has been," but we sincerely hope that the new paper will prove a success in every way.

The Model Engineer numbers for July and August feature illustrated and descriptive articles on the following subjects: A Working Model Petrol Motor; A Model ½" Scale Electrically Driven "Precursor" Loco.; Models at the Wembley Exhibition; A Model Aeroplane; The Model Engineer and his Laboratory; A Model American Railway; Solid Fuel Model Loco.; Notes on the Balancing of Reciprocating Engines; Model Marine Notes; A 2½" Gauge Garden Railway in Australia; How the Steamship Grew Up; Model Steam Engines; A ¾" Scale Atlantic Locomotive; Workshop Problems Competition; Electrical News and Notes; Workshop Topics, Practical Letters from Our Readers; Society and Club Doings. Swindon where they were Royally entertained by the Railway Company's Engineers and saw much that interested them. Mr. Tolsted also visited the great International Exhibition at Wembley where he saw the especially fine exhibit of Models. He spoke very highly of the way the London Society of Model Engineers treated their American guests.

Mr. H. M. Schlader, Cashier of the Chicago Society of Model Engineers was in New York and dropped in to see us. He was out looking for new things of interest to Modelmakers. He saw the "Wade" lathe No. 2 and will be able to tell his friends at home all about it. He was immensely interested. If you are looking for such a tool do not buy one until you have seen Friend Schlader. He knows a good thing when he sees it. We were very glad to meet him.

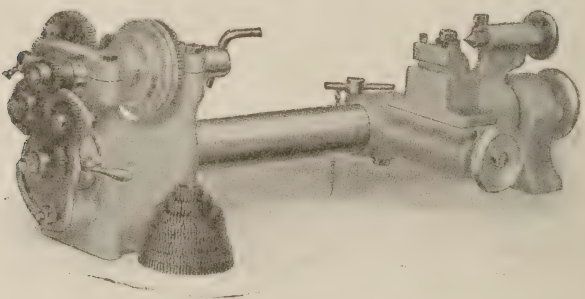
Modelmakers will be interested in learning that the new No. 2 Wade Bench Lathe is now on the market. This is a splendid tool of exceptional workmanship and high accuracy. In general the design follows the lines of the well known No. 1 machine but the headstock has been completely re-designed and is very massive. The hollow spindle is made of mild steel cut from the solid. The white metal bearings are adjustable for wear and the cone pulley is bushed with gun metal. The headstock is fitted with back gears having an approximate ratio of 5:1 and are made of mild steel, cut from the solid, pressed and pinned to a mild steel hub running on a phosphor bronze eccentric shaft. There are 13 change wheels, 28 D.P. and cut all threads, right and left hand, from 6 T.P.I. to 60 T.P.I. They are made of mild steel, machine cut from the solid, and are 5/16 in. wide. The clutch, of mild steel, is simple and protected from chips and dirt. It is bushed throughout with gun-metal, and gives a perfect balanced drive to the leadscrew. The lead screw pitch is 12 T. P. I. and at the rear end running in a gun metal bush. Lubrication of every running bearing has been amply provided for.

The lathe will turn up to 4" dia. and 12" in length. The slide-rest travels the full length of the bed and is fitted with cross feed. The lead-screw runs inside the round bed and is protected from dirt and chips. The Gerold Company tell us that they are now ready to make immediate deliveries.

The American Model Locomotive Co., write that they have received many inquiries for locomotive castings and especially for machined parts of locomotives. They have decided to prepare jigs and special tools to enable them to fill these requirements quickly and as reasonable as possible, realizing that many of their customers are not equipped with the necessary tools to enable them to do all the work themselves. This move on their part will help many young modelmakers to become the happy possessors of real working models at a reasonable price and without a lot of labor on their part.

The "WADE" No. 2 Bench Lathe

Back-Geared — Self-Acting — Screw-Cutting



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Now that the long vacation is over the members of the Montclair New Jersey Model Engineers Club will continue the series of model sail boat races. The enjoyable monthly meetings will be in order and work in the carpentry and machine shops at the Montclair High School will be resumed. All of our readers who are interested and who reside within a reasonable distance of Montclair should write the Secretary, Mr. C. L. Chamberlain, 156 Newark Ave., Bloomfield, N. J. and find out all about this interesting organization. Just send a stamped and addressed envelope.

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Everyday Engineering, Vols. 4 and 5, also early nos., Spon, 120 Liberty St., N. Y.

Mr. Coventry announces that he has now ready the second installment of castings for his P. R. R. K. 4 S. ½" scale Locomotive and hopes to be able to supply the balance of the necessary castings at an early date. He has already disposed of a number of sets so this winter there will be quite a few enthusiasts working on this fine model.

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Blue Prints of Ships for modelmakers—send for circular. G. B. Douglas, 165 Summit Ave., Upper Montclair, N. J.

Locomotives, ½ inch and ¾ inch scale P. R. R. K. 4 S. Pacific type. Working detail prints ½" scale, $10.00 per set. ¾" scale, $17.50 per set post free. Castings for above models supplied, 2c for particulars. H. J. Coventry, Mechanical Engineer, 4003 Carlisle Ave., Baltimore, Md.

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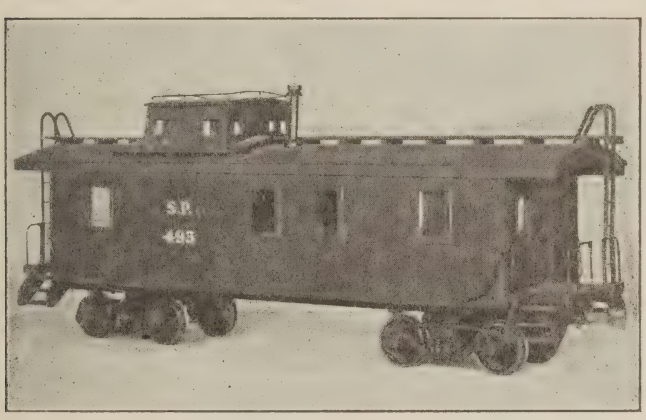

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2¹ Gauge Voltamp Electric Locomotive: Track and ten cars. For particulars R. C. Washburn, P. O. Box 35 Jersey City, N. J.

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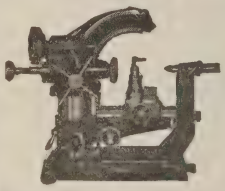

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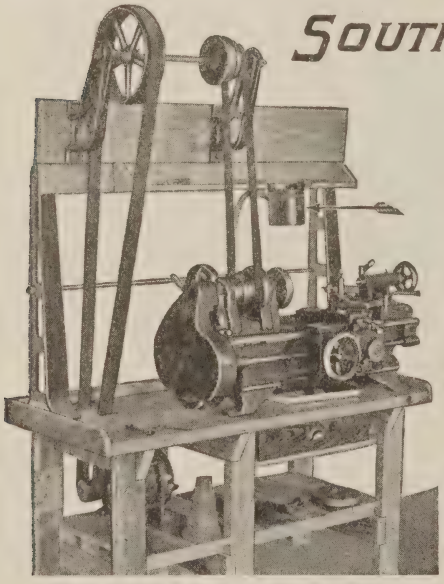

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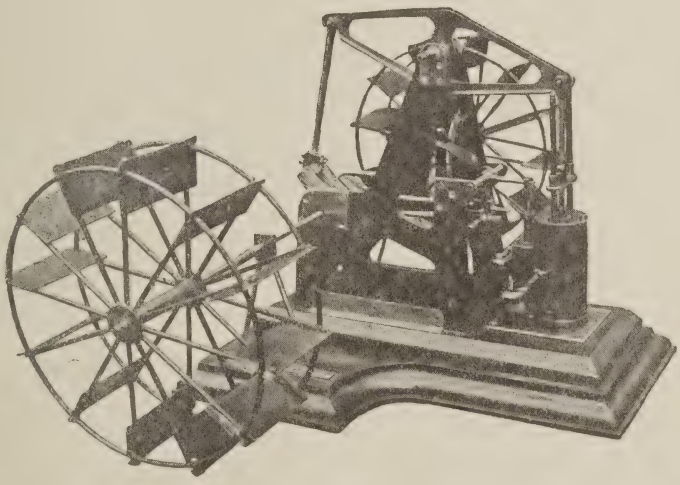

Mr. W. H. BUCKLEY'S SIDE WHEEL BEAM ENGINE for a 6 ft. Boat

THE MODELMAKER

Published by SPON & CHAMBERLAIN

120-122 LIBERTY ST., NEW YORK, N. Y.

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OUR FOREWORD

The publication of this issue completes the first volume of THE MODELMAKER. While its scope has been somewhat limited we feel it has made a good beginning. It has been the means of discovering many new friends who are interested in this fascinating occupation. It has induced a number of other readers to take more than a passing interest in the development of model work. It has been the medium, through which, a good many new customers have been introduced to our Advertisers to their mutual benefit. It has been an encouragement and incentive for new men to take up the hobby by reading about models that other men have constructed. And it has helped, to some extent, to familiarize our readers with the names and addresses of some Model Engineering Societies and Model Boat Clubs in the U. S. and Canada, which we sincerely hope will benefit by the publicity accorded them and bring them many new members.

In hoeing new ground many difficulties are encountered and mistakes are made, but we hope our readers will overlook our errors and in the coming year give us greater support and encouragement to go on and make THE MODELMAKER a worthy representative of the efforts of the Model Enthusiasts of this great continent.

At the urgent request of numerous subscribers we have decided to issue THE MODELMAKER every month commencing in January 1925, and to meet the additional cost of production, the annual subscription will be increased to $1.00.

We especially want to thank our Subscribers for their patronage; our Advertisers for their generous support; the many friends who have sent us encouraging and appreciative letters; those who have contributed articles and illustrations; and the following gentlemen for kindly and valuable assistance: Messrs. Arthur W. Line, F. Drayton Grimke, H. J. Coventry, Cecil E. Hamilton, H. C. Field, Jas. A. Joslin, Geo. A. Cuthbertson, V. A. Scott, and Harry B. Cox.

In closing we wish you all a Very Merry Christmas and may the New Year bring to all of us a larger and truer vision of the real worth and usefulness of Scientific Modelmaking.

The Publishers.

Christmas Gifts. How often we hear a person say, " I don't know what to get for Jack. I have tried so hard to get him something he would like but he never seems satisfied." Why not ask Jack what he would like. We would suggest a few items for Jack to consider. A lathe, a set of tools, a locomotive or a steam plant, a set of castings, a model boat, a good book or books on Modelmaking or a year's subscription to the Model Engineer. Jack, get in touch with our advertisers, then you will be able to make up your Xmas list intelligently.

SIDE WHEEL BEAM ENGINE

By W. H. BUCKLEY

The following is a short description of my Side Wheel Beam Engine which was made out of scrap metal. The principal dimensions are:—

Height of Engine from base, 9½".
Width of Engine at base, 2½".
Cylinder 2½" long, by ⅞" inside diam.
Length of walking beam, 7½".
Width of walking beam in centre, 2".
Length of stroke, 2⅜".
Speed of engine, about 150 r.p.m. when driving boat.
Diameter of wheels, 8".
Width of wheels, 2½".
Size of wheel blades, 1⅛" x 2½" (12 blades).
Over all from outside of wheel to outside of opposite wheel, 20".
Thickness of wire used for rim of wheel, $\frac{3}{16}$", spokes about ⅛" diam.
Length and thickness of main shaft, 6½" to couplings, ¼" diam.
Dimensions of hull of boat—
Beam 15", draught about 4½", length 6 ft., planked.
Steam pressure of boiler, safety valve blows off at 20 lbs.
Boiler was tested to 100 lbs. c.w.p.

The cylinder was made from a piece of brass tubing 2½" long by ⅞" inside diam. The ends were filed off square and it was soldered on to a square brass base made out of a piece of heavy brass tubing split open, hammered and filed flat.

Two pieces of straight steel wire were soldered one on each side of the cylinder, projecting up about 2¾" for the crosshead to work on. Three brass lugs were soldered around the top of the cylinder for screwing the cylinder head on, which is fitted with stuffing box for piston rod.

Steam ports are built up by using one piece of sheet brass with the steam passages sawed out and another piece with the 3 ports bored out both pieces soldered on to the cylinder, care being taken to prevent the solder clogging the ports and at the same time making the joints steam tight.

The cover piece was filed flat to receive the steam chest which was made of a "chunk" of brass dug out and tubing fitted at each end for the valve rod to slide in.

The slide valve is worked by two eccentrics from the main shaft. The horizontal motion being changed to vertical by a rocker arm attached to the wood upright of engine.

The engine is reversed by a lever at front of engine. Attached to this lever is a cross arm fitted at each end with a drop hook, which each "hook" under an eccentric rod. When the lever is put on the "ahead" side, the ahead eccentric rod grab is dropped on to the rocker arm "grabbing" it and working the slide valve. When the lever is put "astern" the ahead eccentric rod grab is lifted off the rocker arm and the astern "grab" of the astern eccentric is dropped into place. When the lever is put half way both eccentric rod "grabs" are lifted off the rocker arm thus causing the slide valve to stop. The eccentric straps are of square iron bent around the eccentric a good fit.

Base of engine is of birch and upright of black walnut. Beam is of sheet brass with iron wire bent and soldered on for "rims." Bearings of brass are fitted on the wood uprights with wood screws countersunk.

The 8" diam. side wheels are built up of iron telegraph wire with galvanized sheet iron from an old coal

scuttle for the blades. Brass ratchets from old clocks furnished hubs. Iron wire spokes were fitted and soldered into these.

A horizontal brass boiler 6" x 9" with 6 cross tubes heated by an ordinary four burner wick wood alcohol lamp furnishes steam which drives the engine at moderate speed in a 6 ft. boat which my brother and I constructed.

The engine can be driven and reversed by blowing the breath into the steam pipe and working the reverse lever.

Mr. V. A. Scott of the Canadian Model Engineering Club writes us—That model engineering has gone ahead by leaps and bounds in Canada is not a complete surprise. She has many sons from the "Old Land" who have known this highly interesting art for a number of years. The development of Model Engineering has certainly exceeded the expectations of the founders and promoters of the movement in Canada.

During the last Canadian National Exhibition at Toronto this fall the Canadian Model Engineers had a most complete and beautiful exhibit. The interest taken by the public was such that it caused much comment and favorable criticism by the Exhibition Management. The exhibit was in the centre of the great Machinery Hall and from morning until night each day great crowds were around the stand.

Mr. J. G. Kent the manager of the Canadian National Exhibition personally expressed his pleasure and promised to assist the Canadian Model Engineers in their future efforts. Some eighty names were given to the Secretary by people who expressed a desire to become better acquainted with the organization.

At a recent meeting a large number of these men were present and again showed keen interest. The outlook for the Society is indeed bright and great things are expected this coming year. Next Exhibition will see a collection of models far greater than any heretofore shown, as those that are now in course of construction will then be completed.

Many of the new members have already started work on models and others are preparing plans and will be started before Christmas. The meetings are being well attended and profitable discussions have taken place. Special speakers will give a series of addresses during the winter months which should prove highly interesting to everyone.

That Model making has come to Canada to stay is certain and rapid development in the hobby is looked for. Canadian Model Engineers have already done some good work but their ambitions far exceed anything attempted in the past and this is backed by an absolute determination to succeed.

We regret that we are unable to give in this issue a full description of the splendid Exhibit of Models at the Canadian National Exhibition, the work of members of the Canadian Model Engineering Club. But in passing we would like to make a few notes regarding some photographs Mr. J. A. Joslin, the Secretary of the Club, has just sent us. Mr. Donaldson's exhibit, finished parts for a Gasoline Engine and the following photographs of Mr. Joslin's work. An exhibit of model engine parts and fittings. Chassis for 4-6-2 Pacific Type Electric Loco all electric outline. A finished smokebox for 4-8-4 "Dominion" Type 3 Cylinder Heavy Duty Tank Loco. Pacific Type Loco 4-6-2, under reconstruction, and one

photo showing end view of solid fuel loco type boiler for rebuilt 4 cylinder Pacific Type Loco. These are designed and owned by Mr. Joslin, and are certainly examples of fine model workmanship. We are very glad to hear they had such a successful exhibit and we hope that all of our readers in Canada will get in touch with Mr. Joslin, 1484 Bathurst Street, Toronto, Ontario, Canada, and find out all about the requirements for Non-resident Membership. We have often been told that "union is strength" but "co-operation" to our mind means a great deal more, because it often means help and assistance from the man who knows gladly and willingly rendered to the fellow member who wishes to learn.

Mr. J. A. Joslin, Secretary of the Canadian Model Engineering Club writes us that he has returned to Toronto after a most delightful trip to England. While there he visited the Wembly Exhibition and saw the very fine collection of Models. He was also a guest of The London Society of Model and Experimental Engineers on their trip to Swindon to visit the Locomotive Shops of the G. W. Ry., where they spent a day going through the different departments of this great plant. He also informs us he has made arrangements to represent the following English Model Making firms: Messrs. Bassett-Lowke Inc., Stuart Turner & Co., Messers. Bond's, and Economic Electric Co., Ltd.

Canadian Model Engineers should make a note of the following address: Mr. E. Almon, "The Hobby Shop," 4859 Sherbrooke St. W., Montreal, P. Q., Canada. Cultivate this gentleman's acquaintance either personally or by mail. His aim in life is to fill every want of the Modelmaker.

Canadian Model Engineers will be interested to hear that the Canadian Model Engineering Club under the able leadership of Sir J. Tulleken, assisted by Mr. J. A. Joslin, Mr. Cox and other energetic enthusiasts have found it necessary to organize a branch of their Society in Montreal. The local Secretary is Mr. Frank L. Lewis, 139 Dobie Avenue, Model City, Montreal, P. Q. The Society will hold their meetings in the rooms over "The Hobby Shop," 4859 Sherbrooke St. W., where members will have the use of the Hobby workshop. What a splendid opportunity to mingle with a number of brother enthusiasts, to have the privileges of the workshop, and rooms to meet in and discuss "Models." Get in touch with Mr. Lewis and join up. Let us hope that before long The Canadian Model Engineering Club will find it necessary to start up branches in some of the other cities in the West.

Just as we are closing up for press we received from Mr. Preston M. Williams two very nice photos and a short description of an excellent Universal Milling Machine. It certainly looks a fine piece of work but we regret we cannot give a description in the present issue, but hope to do so in the January issue of THE MODELMAKER.

Mr. H. J. Coventry is working upon a descriptive article about the construction of his P. R. R. K 4 S ½" scale locomotive which we hope to publish shortly. This article will interest many of our readers, especially those who have purchased a set of blue prints and castings of this engine. He also has in preparation an article on Springs which should interest many of our readers.

THE CONSTRUCTION OF MODEL
MARINE STEAM ENGINES

By F. DRAYTON GRIMKE

A TWO CYLINDER DOUBLE-ACTING ENGINE, WITH REVERSING GEAR (⅝" BORE X ⅝" STROKE)

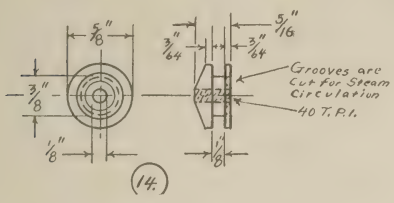
CHAPTER IV.

Layout the draft according to directions previously given in Chapter II. Counter sink small holes on each end, corresponding to the shaft center line. The crankshaft can now be cut out from the block, leaving about 1/32" over size for machining. It is better to leave more material around the section including the two webs, or cranks. Heat this portion of the crankshaft, so that the cranks can be twisted at right angles to each other.

If one or another method is chosen for making the crankshaft, it must be remembered in any case the cranks are 90° apart and have a $\frac{5}{16}$" throw.

Take two round iron, or steel discs, about 2" diam. by $\frac{1}{16}$" thick and make a punch mark in the center of each. On one face of disc, draw, or scratch, the diameter of the disc. Make a mark on the diameter, just drawn $\frac{5}{16}$" from the center. Draw another diameter of the disc at right angles to the first.. This second line will be 90° from the first, and on the last line, make a mark $\frac{5}{16}$" from the center. Center punch and countersink the two marks just made. Mark the second disc in the same way, but remember to have it opposite the first disc, i.e., one disc is used at the head centre of the lathe, while the other is used at the tail center. Now drill a $\frac{3}{16}$" hole through the centers of each disc, and radially drill and tap a small hole in each disc for a set screw.

Force the discs on the crankshaft and see that the centers on the diameters of the discs check up with the center of the cranksaft blank. Mount this jig in the lathe on one of the crank centers. It is better, as previously stated, to place packing pieces between the webs of the other crank, and also packing pieces between the outsides of the webs of the crank being turned and the inside edge of the discs. Turn the crank to $\frac{3}{16}$"



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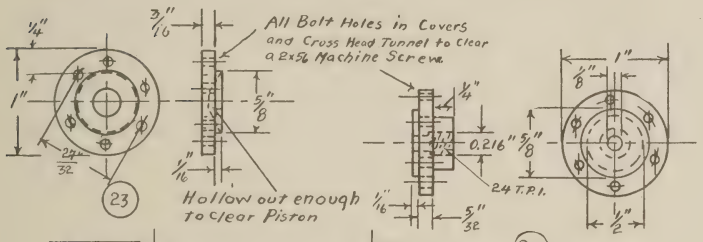
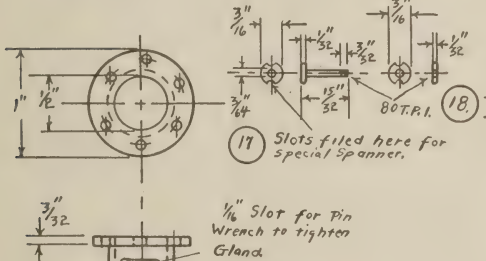

All Bolt Holes in Covers and Cross Head Tunnel to clear a 2×56 Machine Screw.
Hollow out enough to clear Piston
0.216"
24 T.P.I.
1/16" Holes drilled for 1/16" Pin Wrench.
0.216

(23) (25) (28.) (66) (26) (29.)



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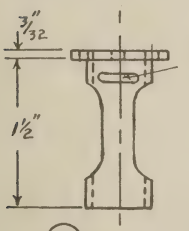

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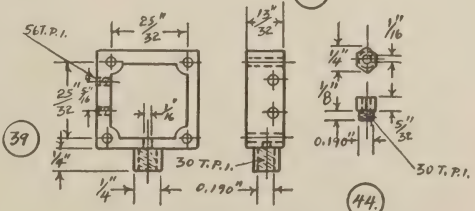


(39) (44.)

diameter exact. Smooth off the inside edges of the webs. Repeat this process for the other crank, remembering that the second crank is turned by shifting the entire jig to the second set of centers on the outside of the discs. The packing pieces must be readjusted for the second crank.

When the two cranks have been turned, remove the two discs and mount the crankshaft in the lathe along its center line and finish in the usual way. Packing pieces must be placed between the webs to prevent distoration.

The roughened ends of the crankshaft may now be cut off to bring the crankshaft to its proper length.

If one desires to use the built up crankshaft, follow the instructions given in Chapter II, remembering that there are two cranks instead of one.

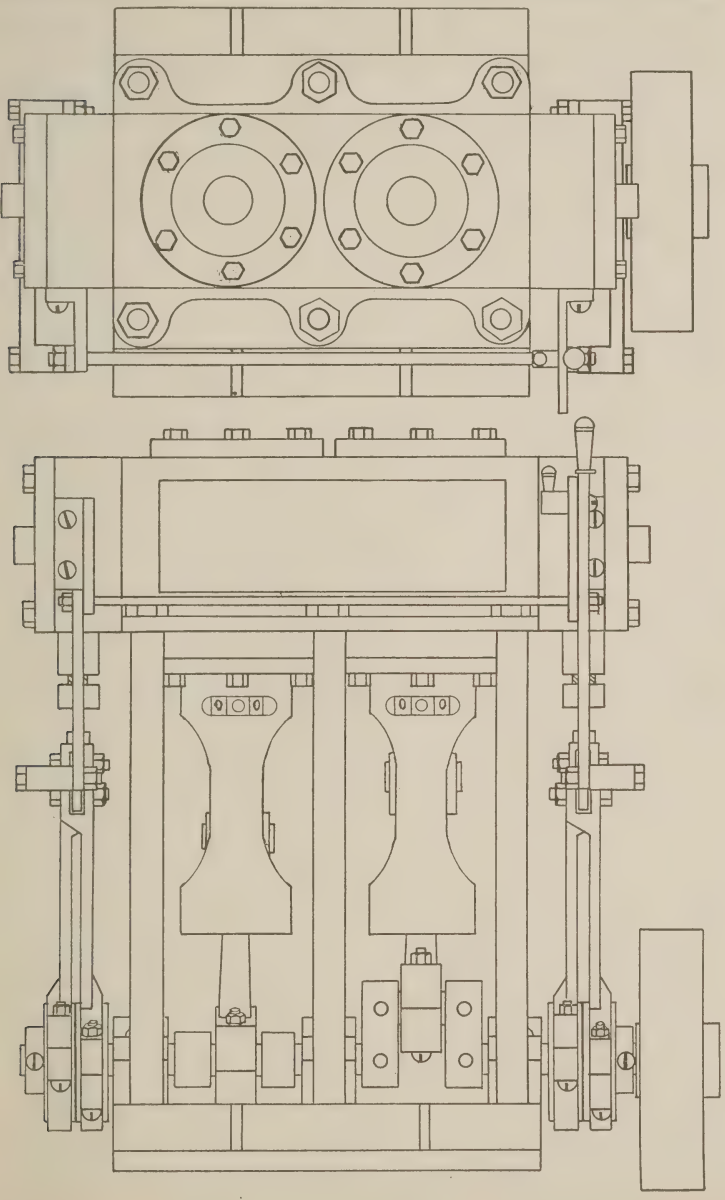
The writer has asked several modelmakers and has experimented himself as to the value of counter balanced crankshafts over plain ones. It was the universal opinion that the counter balanced crankshaft was by far the best.

It is difficult to counter balance a crankshaft cut from a piece of cold rolled steel, except when a piece of metal, twice or three times the usual thickness be used. The extra work entailed in making a crankshaft in this way is not worth it and, therefore I will not consider the question at all.

The built up crankshaft, however, may be easily counter balanced. The webs are cut oversize to the shape as indicated in the drawing, and pinned to the shaft. No definite rules for calculating the size of the webs can be given, as it is mostly a matter of experiment. However this much can be said. Mount the crankshaft on two knife edges and turn the shaft. If one side is heavier than the other, the heavier side may be lightened by filing, and when the shaft seems to be balanced, the webs may be firmly pinned in place.

If one really desires to counter balance a solid crankshaft, one can do so by cutting out a section of the web of the fly wheel.

Catch Plate (Fig. 7). The catch plate casting is mounted in the lathe and turned to an outside diameter of 1". It is then cleaned up all over. Drill and tap a hole in the shoulder for a 2 x 56 set screw. The pin centers are located ¾" apart before the shaft hole is drilled. Drill the pin holes with a 5/64" drill.



The shaft hole is, of course, $\frac{3}{16}$". Two pieces of 5/64" drill rod, $\frac{5}{8}$" long, are threaded or riveted into the two holes in the catch plate.

Pistons (Fig. 14). The pistons are machined (see Chapter II) but the tops are slightly coned, making the altitude of the coned part 3/32".

Cylinder Covers—Top Covers (Fig. 23). The cylinder covers are finished according to directions in Chapter II, except that they are machined out to a depth to give the piston proper clearance.

Cylinder Covers, Bottom Covers (Fig. 26). See directions in Chapter II.

Aft Bracket (Fig. 59). The aft bracket supports the rear end of the motion rod. The holes are drilled to clear 2 x 56 machine screws, by which the bracket is clamped to the steam chest. The motion rod hole is $\frac{1}{16}$" in diameter.

Aft Reverse Lever (Fig. 61). The aft reverse lever is threaded on to the motion rod at the point of fulcrum and the further end is attached to the swinging links. The casting is cleaned up with a fine file and two holes are drilled 1 1/32" apart. The upper, or fulcrum, or pivot, hole is tapped for a 2 x 56 thread, while the lower is drilled to clear a 2 x 56 thread.

Motion Rod (Fig. 62). This rod transfers the motion and movements of the reverse lever to the after part of the engine. It is made from a $\frac{1}{16}$" drill rod, by $3\frac{1}{8}$" long. Both ends are threaded to a depth of $\frac{3}{16}$" with a 2 x 56 die.

Lagging Pieces (Figs. 64, 65 & 67). The lagging pieces, while not absolutely necessary, greatly add to the appearance of the engine. There is a port and starboard lagging piece, the only difference being, that one of them is cut away for the exhaust pipes.

They may be made out of a piece of cigar-box wood and sand papered very smooth. Two holes are vertically drilled in the middle $\frac{1}{4}$" apart with a No. 44 or 45 drill. The pieces may be stained a mahogany color and afterwards shellacked.

The lagging bolts are $\frac{1}{16}$" drill rod by $1\frac{5}{16}$" long and threaded to a depth of about $\frac{3}{8}$" on each end.

Assembly. The engine is assembled in the same manner as the single cylinder engine.

Fly wheel, catch plate, eccentrics are mounted on the crankshaft. The crankshaft, in turn is mounted on the base, after the

ITEM	PART	No. Req.	Mark	SIZE	REMARKS
1	Base	1	(1)		Casting
2	Bearing Cap Bolts	6	(5)	2×56 3/16"	Steel
3	Bearing Shims	6	(3)		Taggers Tin
4	Standard	6	(2)	3/16" D.	Drill Rod
5	Ditto Nuts	6	(68)	5×40	Brass
6	Cylinder	1	(13)		Casting
7	Crankshaft	1	(4)		Steel Built Up
8	Flywheel	1	(6)		Casting
9	Catch Plate	1	(7)		Casting Steel Pins
10	Ditto Set Screw	1	(8)	2×56 1/8"	Steel Round Head
11	Forward Eccentric	2	(9)		Casting
12	Ditto Set Screw	2	(10)	2×56 1/8"	Steel Round Head
13	Backward Eccentric	2	(11)		Casting
14	Ditto Set Screw	2	(12)	2×56 3/16	Steel Headless
15	Piston	2	(14)		Casting
16	Piston Rod	2	(15)	1/8" D	Drill Rod
17	Crosshead	2	(16)		Casting
18	Wrist Pin	2	(17)	3/16" O.D.	Drill Rod
19	Ditto Washer	2	(18)	3/16" D	Drill Rod
20	Connecting Rod	2	(19)		Casting
21	Ditto Bearing Bolts	4	(20)	2×56 17/32"	Steel Round Head
22	Ditto Nuts	4	(21)	2×56	Steel
23	Ditto Shims	4	(22)		Taggers Tin
24	Top Cylinder Cover	2	(23)		Casting
25	Ditto Bolts	12	(24)	2×56 1/4"	Steel Hexagon H'd.
26	Ditto Gasket	2	(25)		Tin Foil, Heavy
27	Bottom Cylinder Covr	2	(26)		Casting
28	Ditto Gaskets	2	(28)		Tin Foil, Heavy
29	Crosshead Tunnel	2	(30)		Casting
30	Piston Gland	2	(29)	5/16" D	Hexagonal Brass Rod
31	Steam Chest	2	(39)		Casting
32	Ditto Cover	2	(41)		Casting
33	Ditto Bolts	8	(43)	2×56 3/4"	Steel Hexagonal H'd.
34	Ditto Gaskets	4	(40)(42)		Tin Foil, Heavy
35	Valve Rod Gland	2	(44)	1/4" D	Hexagonal Brass Rod
36	Valve	2	(45)		Casting
37	Valve Rod	2	(46)	1/16" D	Drill Rod.
38	Ditto Yoke	2	(48)		Casting
39	Ditto Pin	2	(49)	2×56 1/4"	Steel Hexagonal H'd.
40	Ditto Nut for Pin	2	(50)	2×56	Steel
41	Reversing Link	2	(38)		Casting
42	Eccentric Rod	4	(32)		Casting
43	Eccentric Strap Bolts	8	(33)	2×56 1/2"	Steel

bearings have been scrapped. Shims should be placed in the main bearings. The standards are next screwed home.

Piston, piston rod, bottom cylinder covers, cross-head and cross-head tunnel are mounted. Tin foil gaskets should be placed between the cross-head tunnel, the bottom cylinder cover and the cylinders.

The valve is threaded to the valve rod and inserted into the valve chest. Pack the gland after the valve rod has been placed in its proper position. Gaskets are used between the valve chest cover, valve chest and cylinder.

The assembled cylinder is placed on the standards in its proper position and securely fastened down.

Place the connecting rods on the crankshaft and insert the wrist-pins in the cross-head.

The links and eccentric rods are assembled and fastened to the eccentrics. The eccentrics, looking at the engine from the starboard side and reading from forward to aft are 1, 2, 3 and 4. Eccentrics 1 and 4 have collars and are placed outside, while 2 and 3 without collars are placed next to the base. Again eccentrics 1 and 3 are the "ahead eccentrics" while 2 and 4 are the "astern eccentrics."

Eccentrics 1 and 3 are set as **previously directed**, while 2 and 4 reverse the engine.

The quadrant and after bracket are bolted to the steam chest. The reversing lever threaded to the motion rod and placed in position. The after reversing lever is screwed to the motion rod and placed on the outside of the bracket. All lock nuts are now tightened.

The swinging links are placed in position and bolted on. The reverse lever is moved to the ahead position and see that the ahead eccentrics line up. The chances are that the rear eccentric strap will not and this adjustment can be made by adjusting the rear reverse lever. When this has been done, move the reverse lever to the opposite position and make any adjustment necessary.

Before the valve or steam chest covers are placed on, squirt a lot of heavy cylinder oil into the valve chest. The cover can now be bolted on. Some oil should be placed in the cylinder before the covers are bolted on.

Do not forget that the valves are set according to **previous directions** and that gaskets should be made for all pieces clamping to the cylinder block.

ITEM	PART	No Req	Mark	SIZE	REMARKS.
44	Ditto Nuts	8	(34)	2x56	Steel
45	Ditto Shims	8	(35)		Taggers Tin
46	Eccentric Rod Pins	4	(36)	2x56 1/4"	Steel Hexagonal H'd
47	Ditto Nuts	4	(37)	2x56	Steel
48	Swinging Link	2	(51)		Casting
49	Ditto Pins	4	(52)	2x56 7/16"	Steel Hexagonal H'd
50	Ditto Nuts	4	(53)	2x56	Steel
51	Reverse Lever	1	(54)		Casting
52	Ditto Lock Nut	1	(55)	1/8" D.	Round or Hex. Brass Rod
53	Ditto Lock Nut Bolt	1	(56)	2x56 3/16"	Brass Round Head
54	Quadrant	1	(57)		Casting
55	Ditto Bolts	2	(58)	2x56 1/4"	Brass Round Head
56	Motion Rod	1	(62)	1/16" D	Drill Rod
57	Ditto Nuts	1	(63)	2x56	Brass
58	Aft Bracket	1	(59)		Casting
59	Ditto Bolts	2	(60)	2x56 1/4"	Brass Round Head
60	Crosshead Tunnel Gaskets	2	(66)		Tin Foil, Heavy
61	Crosshead Tunnel Bolts	12	(27)	2x56 6/16"	Steel Hexagonal H'd
62	Valve Adjusting Nut	2	(47)	0x80	Brass
63	Reverse Lever (After)	1	(61)		Casting
64	Lagging Pieces	2	(64) (67)		Wood
65	Ditto Bolts	2	(65)	2x56 1 5/16"	Steel Headless
66	Ditto Nuts	4	(70)	2x56	Brass
67	Ditto Washers	4	(71)	1/8" - O.D.	Brass
68	Special Screw Driver	1	(72)	3/32"	C. R. Steel
69	Spanner	2	(73)	2x56	C. R. Steel
70	1 Spanner	1	(74)	5x40	C.R. Steel
71	Pin Wrench	2	(75)	1/16" D	Drill Rod
72	Wrist Pin Wrench	2	(76)		C. R. Steel
73	Spanner	1	(77)	5/16"	C. R. Steel
74	Spanner	1	(78)	1/4"	C.R. Steel
75	Jeweller's Screw Driver	1	(79)		

NOTE;— 1. All drawings are presumed to be full size, except PLATES I, II and Marks 3, 22, 35, 48, 53 and 72—78 inclusive. PLATES I and II are for General Reference Only. All dimensions are to be taken from Detail Sheets III, IV and V.

2. All Bolts, Nuts and Screws are A. S M. E. Standard. Threads are A. S, M. E. 0x80, 2x56 5x40, 10x30, 12x24.

3. If a Non Reversing Engine be desired Item Numbers Omitted 13, 14, 41, 42 (2 Required) 43 (4 Required 44 (4 Required) 45 4 Required) 46 (2 Required) 47 (2 Required) 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59 and 63.

4. 10x80 Spanner Mark 80. 1 Spanner for 2x56 Hexagonal Head, Mark 81, to be included in above List.

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The engine is broken in as previously directed and all moving parts are flooded with oil and tightened up from time to time as may be necessary. When this has been done, the lagging pieces are placed on. Shredded asbestos should be used between the lagging pieces and the cylinder to prevent the former from becoming burnt and warped.

The steam pipes and lubricators are made and installed in the usual way. All this has been previously described.

Tools. Three or four spanners, pin wrench, special screw driver and wrist pin wrench are required for this engine. These are made from cold rolled stock $\frac{1}{16}$" thick and hardened according to the usual practice. The drawings explain just what is required

Final Word. All that has been said about the single cylinder marine engine, also applies to the two cylinder engine.

The writer desires to express his thanks to the Publishers and also Mr. Thomas Bray for the suggestions, criticisms and interest, which he has shown in examining and checking up the drawings for this engine.

The Model Engineer numbers for September and October contain the following principle articles: Model Engineers and Their Work. Atmospheric Impulse Pump. Among the Models at the British Empire Exhibition. Model Engineers Visit to G. W. Ry. Works at Swindon. Oscillating Wind Pump. Design for No. 1 Gauge Model Electric Express Locomotive. How the Steamship Grew Up. Scale Working Model of L. N. E. Ry. Pacific Locomotive. "Pulsometer" Pumps. A World Record Model Monoplane. Model Engineering Exhibition at Dublin. A Single Cylinder Condensing Horizontal Steam Engine. Some Additions to a Well Designed Vertical Compound Steam Engine. A Built Up Vertical Pop Valve Steam Engine. Model Vertical Steam Pump. Fractional H.-P. Alternating-Current Motors. Locomotive News and Notes. Shops, Shed and Road. Workshop Topics. Model Engineers Exhibition at New Castle-Upon-Time. Queries and Replies. Practical Letters from Our Readers. Society and Club Doings. Model Marine Notes. Model Boat Races. News of the Trade. Prize Winners in Our Problems Competition. Articles are all profusely illustrated, price 14 cents per number. Spon & Chamberlain.

The Mechanical Boy. The first nine numbers of this periodical are now published. These numbers contain many interesting articles on all kinds of topics and things of every day interest. They are written in a non-technical language so that the ordinary reader can thoroughly understand them. Each number is profusely illustrated. Numbers are 12 cents each. Spon & Chamberlain, Agents.

Have your numbers bound. After some efforts we have succeeded in finding a very good jobbing binder who produces good work at a reasonable price. We shall be very glad to take care of binding for customers. For information kindly address Binding Dept., Spon & Chamberlain, 120 Liberty St.

MODEL ENGINEERING AND ITS DEVELOPMENT IN AMERICA

By GEO. A. CUTHBERTSON

The day seems to have really arrived at last here in America, when model makers of all classes are uniting to enjoy the mutual benefits of society and club intercourse, also through the medium of correspondence with one another. The time when the modelmaker had to use every form of his own natural wit to make a real thorough job of his model, seems to be fast passing into history, and the advent of a different state of affairs has taken place. What we are now beginning to see, is an era when modelmakers all over the country will give each other encouragement and concrete assistance, in a thousand ways, and last and not least, the General Public are beginning to appreciate the work done by modelmakers, in producing something that is really instructive.

It has been a long time in coming, this day, and there are many, alas, who had hoped to see it, but who went to their last resting places entirely unknown and unappreciated, except to the rare few who were fortunate enough to be acquainted with these men and their work. It is most unfortunate that the names and work of some at least of these pioneers are as yet unknown, but it is to be hoped, that with the spread of public interest in model making, which now is taking place, that by some chance, these pioneers' names will be discovered, and that someone will take time to give a description of them and their labours. This task rests with future disciples and enthusiasts in the art of model making, and it will be a stimulus to them to know that there is a definite task ahead of them in looking up and discovering these histories.

Model making in America (and I mean Canada too) has of course been carried on by many men, but under most adverse circumstances, and generally has been confined to the efforts of scattered individuals. That is, model making in its true form, and for the benefit of those who really do not know what is meant by model making, I might say that model making is the construction and erection of machinery which is a copy of some prototype, and which is mathematically correct in every detail of this prototype.

A model is not a toy, but is a copy of the machine it is built to represent. The reason for the existence of most models, is the fact that their creators have desired to build a permanent replica of a machine that they were personally interested in. The desire to create such a replica can also be credited to a need on the part of the builder to have been better able to acquaint himself with the operation or construction of the machine they are copying. The model thus serves an educational purpose, and which after all, is the real purpose of model making.

To call a model, **a model,** as stated before, it must really be built to scale. That is, all its parts bear a proportionate relationship with each other. A toy, on the other hand, may be well made, and nice to look at, and efficient to operate, but it automatically becomes a toy, if it is not made to scale.

This description of the difference between models and toys seems to lay down certain hard and fast rules, but these rules can after all be amended to, in order to cover a vast field of creative enterprise which is really true model making and not toy making. It is not the purpose to set down herein all these rules and what they cover, but the idea in bringing in this description of what model making really is, has been to simply differentiate the two.

As has been said, model making has been confined, heretofore, in America to individual effort. There has been no attempt made, until just recently, for model makers to come together in some way. There have been no societies or clubs formed of groups of model makers, until only lately, neither has there been any medium of the press devoted to their behalf. The result has been as described before. Men have lived and died who were capable of almost unlimited ability, who had their efforts as it were hid under a bushel.

But what will this general activity lead to, and what are its benefits? Simply this. Creative effort on the part of mechanics and amateur mechanics will be better known and appreciated. The result of patient and good work will receive some form of concrete reward, such as prizes, awards, trophies, medals and so forth. The artisan will have something to strive for, and in this very striving, put all the ingenuity, and (to use slang) "pep" into his work. This is a mechanical age, and men acquainted with mechanics are always in demand. Thus the mechanic who shows interest in his calling sufficiently to construct models of some

particular job in his "off hours" will find ready appreciation of his honest efforts in at least two ways, to his own benefit. He will be able to receive a reward for his work from whatever society he may belong to, and his work, when it becomes known to his superiors or employers, will give him a stronger place in the employ of his firm than he would otherwise get. This only would be natural, but it is generally known that the expert craftsman is usually an uncommunicative man, and hence it is the purpose of model engineering clubs and societies to draw these men out as it were from their shells. To the amateur craftsman, the development of model engineering opens a still more interesting field perhaps. The amateur is the man who does a thing for the love of the thing, as a hobby, and it gives these men the same benefit so far as the question of awards for his work is concerned, but it also will give him a feeling that his hobby is one that contains a wide range of educational advancement.

It is not my purpose herein to make comparisons (which are sometimes odious) between American and British model engineering. However, it will not be amiss to mention in passing, that much valuable knowledge, and helpful hints, can be gleaned by American Model Engineers from their British cousins. And it is to be hoped that eventually, American and British model builders will be afforded the opportunity of competing for some form of an International Trophy that will provide a stimulus for a greater enthusiasm and exchange of ideas between the two.

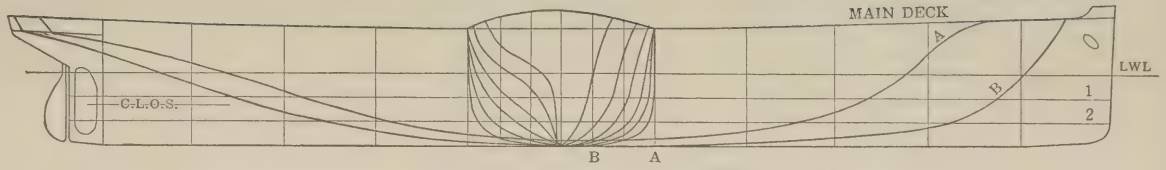
The field ahead of model engineers in America provides a great deal of effort along constructive and interesting lines. There are already societies in all parts of the country, both in the United States and Canada, that should be linked up by a form of by-laws that will lead to the promotion of one big society. This society can provide a diversified series of assistances to all connected with the society, and for all those who may wish to join it. The main thing required is publicity, and this can be gained in many easy ways. This publicity will do more for actual model engineers, and those who are model makers in embryo, than anything else imaginable. It will strengthen the memberships of the various clubs and societies, and will also bring to the light men who would otherwise be working in comparative darkness so far as their knowledge of what is going on around them.

What is also needed very badly, owing to the large area of the continent, and which will be the quickest way of bringing about the interest and development of such model engineers as may be in out of the way places, is to have some form of communication between such isolated individuals, and to bring them in close touch with their more fortunate brethren in the centres and cities. This can be accomplished in truly American fashion, by a system similar to the one used by our mail order houses.

The various clubs or associations should organize for enrolling out of town members, by providing books, papers, reference drawings and the like, which can be mailed to an out of town member, and returned by him when finished with. Also scrap books can be sent from one out of town member to another, in which each can contribute some article or drawing or photograph relative to model making, and which will do more than enough to keep members in touch with each other. It is not my purpose to describe any ways and means to accomplish all this, except that steps are now on foot at least in Canada, to do this, and the writer is privileged in being actually interested in this development work.

In conclusion, it might be well to add, that the trade is being slowly interested, but surely, in the advantage of selling good, useful and necessary supplies to American model makers, and it is really to their own advantage that model makers should patronize and encourage all tradesmen who are doing their best to cater to their requirements. The day is not far distant, when a model engineer, no matter whether he may live in the most out of the way place in northern Quebec, or central Texas or in New York City, will be able to obtain helpful advice from the society to which he may belong in regard to some little difficulty he may have encountered in construction, or even to some little screw or bolt, or a steamer ventilator, that he may need and which he cannot produce himself, as I say, the day is really here when this can be done, right here in America, and it is, and should be, the duty of every model engineer to work for the cause as much as he possibly can. The result will be, that a few years hence, model engineering will become universal in its development, and the exhibitions will be the commonplace, where the work of our model makers can receive well deserved praise from an interested and appreciative public.

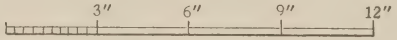
BODY PLAN

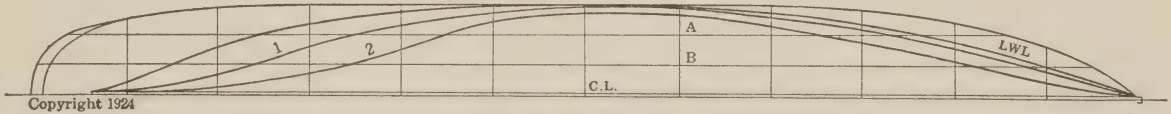


SHEER PLAN

LINES FOR A MODEL CARGO BOAT

Cecil G. Hamilton





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HALF BREDTH

A DESIGN FOR A MODEL CARGO STEAMER

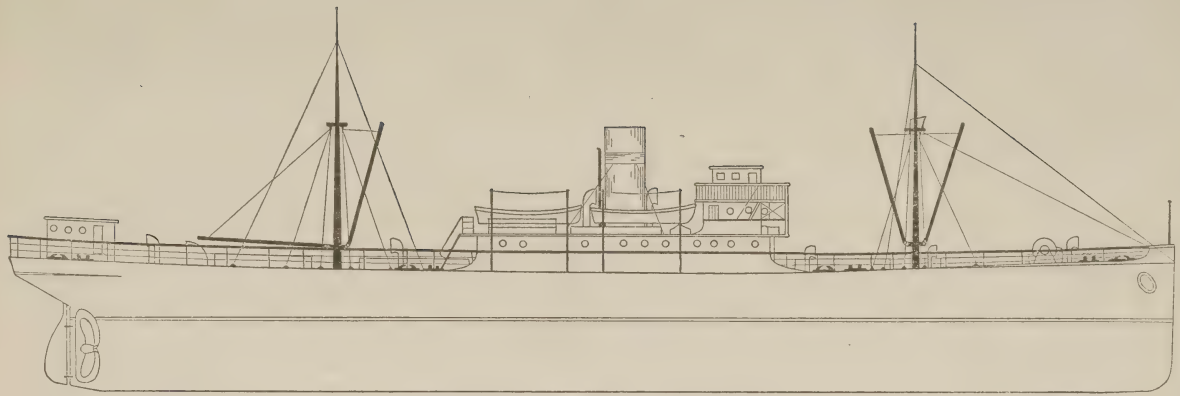
By CECIL G. HAMILTON

The chief consideration, in the design of the Model Cargo Boat about to be described, was simplicity, coupled with as realistic an appearance as possible to its particular prototype. The hull measures 36" oa., with a beam of 6" and a draft of 2¼", giving a good broad stable hull with plenty of room, so that the standard machinery already on the market could be easily installed. As the lines are simple and straightforward, the amateur, with a little knowledge of woodworking tools should have no difficulty in cutting the hull out of a block of good pine, and hollowing it out as described in the writer's article in the May issue of "THE MODELMAKER."

Here a word will be necessary, in regard to cutting the propeller aperture, this part of the job must be done carefully, to prevent splitting that portion of the hull to which the rudder is affixed.

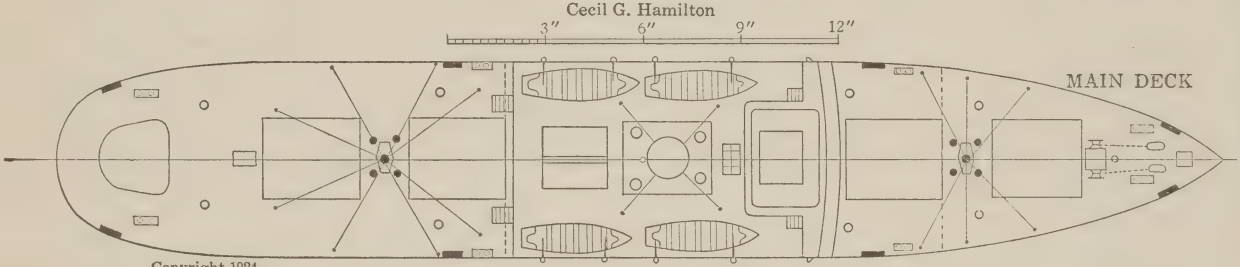
Having decided on the method and secured the material to be used, the next thing to be done is to set out the design full size and "fair" up all the lines. It is surprising how the errors creep in to a set of lines when they have been reduced and then brought up to full size again; but this is always the case and the writer on one occasion spent a considerable time reducing a set of lines and then as an experiment, carefully brought them up again and found that at some points the lines were "out" as much as three-eighths of an inch. However with patience and a little give and take here and there, the "lines" will work out near enough for all practical purposes.

There has been no particular kind of machinery suggested as this is left to the individual builder. It can be either steam or electric. There are quite a number of really good plants on the market, the addresses of the firms supplying such parts can be found in the adv. pages of "THE MODELMAKER." Steam is a very good method of propelling a model. In a case where there is a number of nice fittings, and, a model is built for appearance, the electric motor and accumulator are to be preferred on the score of being cleaner and more easily handled.



DESIGN FOR A MODEL CARGO BOAT — PROFILE

Cecil G. Hamilton



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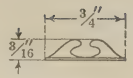
The design provides for a single screw 1¾" dia., 3 bladed, which can be a casting or can be made by turning a boss and cutting three slots at an angle of about 35°, then after roughly cutting out the blades they can be soldered in and bent to shape then the whole filed up true. The model should not be driven beyond 3 or 4 miles per hour as the prototype is perhaps the slowest of all boats and in this case more attention should be paid to the fittings than the speed. The writer has seen some very fine examples in this respect although most of the fittings were made from "scrap" wood and metal neatly finished.

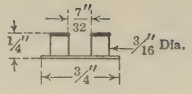
The hull having been finished inside and out, the next job will be the fitting of the stern tube and propeller shaft, this presents no special difficulty. A short piece of brass tube is obtained and squared off even at the ends (tube is $\frac{5}{16}$" outside dia.) and two brass bushes made to fit over the ends, such bushes having a hole to let the shaft through and then the tube is filled with thick tallow and oil, the drawing, fig. 1, explains this. The hole in the hull for the tube is burned through with a red hot wire from the inside. The machinery can then be installed.

Attention must now be given to the deck fittings for these are what makes, or mars, the finished model and as they are small, neatness is essential. Commencing at the bow there is first the fairleads (Fig. 2) and these can be filed out of brass or bought ready for a few cents as can be the Bollards or bitts. (Fig. 3). The builder can if he so desires fit a windlass at the bow to handle the anchor chains or he may just pass them down the holes in the deck and fix them underneath. The anchors Fig. 4) (stockless) are filed out of brass and the chains can be got quite cheap. The cargo hatches (Fig. 5) are made of wood (Walnut preferred) and clear varnished being screwed to the deck from underneath. The masts and derricks are made from a nice straight grained piece of pine, the eye bands being forced on. The hooks and eyes for the rigging are made from bent pins, all this gear being shown in Fig. 6. The derrick platforms are made of thin wood, and shaped as shown. The four ship's boats are cut from the solid and hollowed out a little and a few seats glued in. The davits for holding them are made of brass wire with eyes fixed so as to hold them to the ship side (Fig. 7). The builder will probably buy his ventilators as they are a very difficult job even for an expert. The design has nine small and

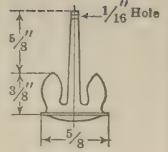
STERN TUBE AND GLANDS
FIG. 1



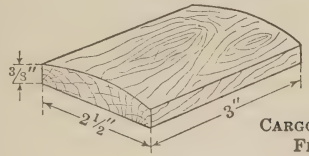
FAIRLEADS
FIG. 2



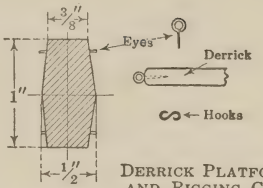
BOLLARDS
FIG. 3



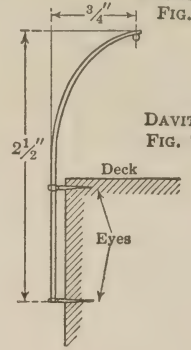
ANCHORS
FIG. 4



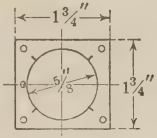
CARGO HATCH
FIG. 5

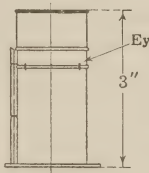


DERRICK PLATFORMS
AND RIGGING GEAR
FIG. 6

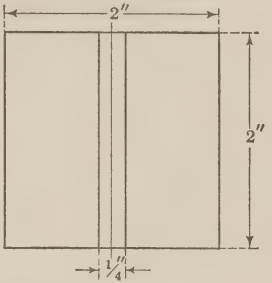


DAVITS
FIG. 7





SMOKESTACK
FIG. 8



ENGINE ROOM HATCH
FIG. 9

DECK FITTINGS FOR MODEL CARGO BOAT

Cecil G. Hamilton

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four large, but more or less can be added to suit. The smokestack is a piece of thin tube soldered to a square plate this in turn being screwed to the deck, four eyes are provided in the smokestack for the guys (Fig. 8). The bridge houses are made from blocks of pine painted white with the doors and windows drawn on in chinese ink. The decks are of pine, clear varnished. The Engine room hatch aft of the smokestack is also made of wood with square windows having two round lights in each (Fig. 9).

A word may now be said in regard to the method of access to machinery, and the writer suggests that the bridge deck be made removable from the No. 2 cargo hatch to the No. 3 dotted line shown in deck plan. This should be ample space. The rails can now be added to the fore and aft decks and the model is ready for the lake.

It is usual in this class of vessel to paint the underbody a bright red and the top black a white line being drawn round at the L. W. L. The deck houses, boats, etc., painted white while the masts and derricks are a buff color. The builder can paint the smokestack in whatever colors he wishes, for example, in the colors of some well known steamship line. In closing, if a steam plant is used some thin asbestos should be used inside the hull and under the deck to prevent the paint blistering.

This may seem a very difficult job for an amateur but by taking time and using patience a very neat little model can be built, that should provide plenty of sport.

Mr. T. C. Daniels has sent us a small photo of a Model Sailing Yacht (Solent type) he has just finished. The keel and ribs are of beech; planking white pine 1″ strips by ⅛″ thick; deck white pine ⅜″ by ¼″ thick. Length 48″, beam 8″, draft 7½″. Fin and underbody painted white. From the picture it looks like a well built Model. We hope it will prove a good fast boat.

Mr. A. B. Reynolds has just completed a Model Racing Schooner. He used the lines of Mr. Daniel's "Prospero" described in Marshall's "Model Sailing Yachts," but reduced the proportions to ¾ the original size. Deck length 46″. Weight complete with all gear about 15 lbs. From sailing tests he finds she points well, is fast in a light breeze and stands up in a blow. He is now working upon another boat using the same lines but this one will be full size.

The Gerold Co. inform us that they have already placed a number of the new Wade Lathe No. 2 and that they have had many appreciative letters from well satisfied customers.

One of our readers informs us he is hard at work on a locomotive for a garden railway. A scale model of a U. S. Ra. Administration Standard Heavy Pacific 4-6-2, 3½" gauge. Cylinders are 1½" bore by 2¼" stroke, with 6" diam. driving wheels. Length of boiler 40", diameter of boiler at smoke stack 6". Length of engine 4 ft., length of tender 2 ft. Total loaded weight 200 lbs. Height from rail to top of smoke stack 14". Fuel will be hard coal. Fitted with Baker valve gear, two working injectors, four safety valves, steam brake, and regulation fittings in cab. He has promised to give us fuller details when the engine is finished and has been tested out under steam. He will then be able to supply complete working drawings and castings. This reader has built several other types of locomotives that have proved very efficient under steam. We believe that the above engine, when completed, will be one of the finest Models ever built in the U. S.

Mr. G. A. Diehl has sent us a fine photo of a Pacific Type Locomotive 4-6-0 he has just completed. The scale is ½", boiler 14" long by 3¼" diam.; grate area 10 sq. in.; heating surface 165 sq. in., Stanley steam flues ½" diam.; boiler pressure 220 lbs. per sq. in.; fuel, coal. Driving wheels 3" diam. Cylinders are built up of brass plates and steel tubing for cylinders and valve chests, with flattened tubes for ports, all pieces brazed together making strong, light, and inexpensive cylinders. Cylinders ¾" bore by 1" stroke. Valves $\frac{7}{16}$" diam. Pistons and valves are turned in the lathe from solid stock. The valve gear is Walschaert. Engine is operated by lever and quadrant in cab. Boiler fittings—automatic cylinder lubricator, safety valve, whistle, bell, steam gauge, water glass, super-heater, blower, feed water check valve, and boiler blow-off. Electric headlight supplied with current from battery carried in the rear part of the tender. The tender carries 7 lbs. coal and 1 qt. of water. The water is fed to the boiler by a very small uniflow steam pump carried in the tender, the bore is ⅜" by ⅜" stroke. The water pump has a bore of 5/32", it delivers ½ a pint of water per min. The pump is placed under the drive wheels. Rigid wheel base 6½". The locomotive is 37" over all. There are only 24 castings in the complete locomotive most of which are the wheels. The locomotive was made without any drawings except a valve gear diagram. The engine gives a drawbar pull of 10 lbs. The weight in working order is 32 lbs. It has pulled three 40" coaches, a total of 70 lbs., at the scale speed of 92 miles per hour. A pretty good record for a model of this type.

The Model Machine Shop Co. report they are making up a number of completed sets of a very compact Power Plant for a boat, flat bottom or vee type, 30" to 36" overall. This Plant consists of a Single Cylinder Double Acting Marine Engine, ⅝" bore by ⅝" stroke, from bronze castings, connected to a flue-tube boiler, constructed of brazed steel tubing containing 8 cross tubes. The boiler has the following fittings: safety valve, pressure gauge, 2 pet cocks and throttle valve. There are also the stern tube and stuffing box, propellor shaft and propellor, vee strut, universal joint, and gasoline blow torch. The complete plant is ready for installing. This firm make engines, boilers and models to customers' designs. They also specialize in the construction of Model High Speed Power Boats installations.

Mr. Douglas Getty has sent us a photo of his Locomotive Great Northern, 4-4-2. The following are the principal details: 2⅝" gauge; ½" scale; boiler, water tube type; frames straight bar type in cold rolled steel; cylinders, bronze castings, ¾" bore by 1 7/16" stroke with slide valve lined up to look like the regular standard piston valve type; driving wheels, 3" diam. of bronze; sand dome, steam dome and air pump are all dummies; bell; water glass; throttle; check valve. Safety valve blows off at 60 lbs. per sq. in. Pump in tender to supply water to boiler; wheel base, engine 14½" wheel base, tender 12"; total length of locomotive 35¼"; height 7 11/16"; weight 28 lbs.

The American Model Locomotive Co. are just putting on the market a welcome addition to their fast growing list of models. A ½" scale 80,000 lb. capacity Box Car. They can supply it finished ready to add to your rolling stock or will furnish a complete set of the material for the Modelmaker to build himself. Get in touch with them and they will give you full particulars.

BOOK REVIEWS

Electric Wiring Diagrams for Motor Vehicles by M. A. Codd, 95 pp., 88 diagrams, 10 x 6¾ in., boards, $1.05.

Embracing all the leading systems of lighting, starting, and ignition for British American and European Motor Vehicles Broadly there are two methods of wiring; "the earth return system used almost exclusively on American cars" and the insulated return which is mostly used on foreign cars but this system is gradually being replaced in favor of the American method. These diagrams should prove of value to all motor car repair men.

Steam and Other Useful Tables, for engineers and steam users by P. W. McGuire, VIII, 96 pp., 2⅝ x 1⅞ in., limp cloth, 60 cents.

This is one of the Spon vest pocket books and it contains a great deal of practical information used by the engineer from day to day. The data is mostly arranged either in simple formula or as tables.

More Paper Magic, by Will Blyth, 124 pp., 239 diagrams, 7¼ x 5 in., boards, 80 cents.

This work will be an invaluable aid to all who desire to entertain and amuse others by means of a sheet of paper. It also contains much material for individual amusement and recreation. The descriptive matter is very lusive and the diagrams are very clear. An excellent book to give you pointers for Christmas entertainment.

Watch Repairing and Adjusting, by W. L. Randell, 46 pp., 25 illus., 7¼ x 4¾ in., paper, 35 cents.

This small work is intended for the amateur who is desirous of obtaining a practical working knowledge of the various kinds of watch mechanism; how it works and how to repair and clean it. It seems to cover the necessary points in a way that any ordinary person can understand it.

The Book of Motors (Automobiles) by W. G. Aston. VI + 229 pp., 125 illus. and 8 colored plates, 10 x 7¾ in., cloth, $2.75.

The Author treats his subject from the popular standpoint dealing with leading English types of automobiles in a very entertaining manner. He also gives a good deal of practical information and directions for the running management and upkeep of these very high class cars. The fine illustrations add very much to the value of this work.

The Railway Signal and Permanent Way Engineer's Pocketbook, second edition considerably enlarged, 326 pp., many illustrations and folding plates, 5½ x 3½ in., cloth, $2.00.

Although this is an English work it contains a great deal of information that will interest and instruct the model engineer whose bent is Model Railway work. This is especially true of the chapters on Signals and Signalling devices, track points and crossings and electrical equipment of railway tracks.

SOCIETIES

Boston Society of Model Engineers, J. L. Brackett, 13 Charles St., Wakefield, Mass.

Brooklyn Model Yacht Club.

Canadian Society of Model Engineers, "Montreal Branch." Mr. Franck L. Lewis, Secretary, meeting place, The Hobby Shop, 4859 Sherbrooke Street West, Montreal, P. Q.,

Canadian Model Engineering Club, Headquarters Toronto, Canada. Secretary Jas. A. Joslin, 1484 Bathurst Street, Toronto, Ontario, Canada.

Central Park Model Yacht Club, H. Griffith, 609 W. 147th St., New York.

Chicago Society of Model Engineers, S. C. Swanson, 7826 Coles Ave., Chicago, Ills.

Detroit Model Yacht Club, Mr. H. C. Field, Sec., 323 Ontario St., Windsor, Ontario, Canada.

Toledo Model Yacht Club, Mr. D. A. Heinle, Sec., c/o Meilink Steel Safe Co., Toledo, Ohio.

If any of the above clubs have changed Secretaries or address, will the new Secretary kindly advise us his name and address.

We shall be glad to receive names of any new clubs, also the name and address of the secretary.

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J. W. A. Springfield:—We have never heard of a Perpetual Motion Machine that was a success. A well known Civil Engineer and Scientist, Mr. Henry Dircks, made a profound study of this subject and in the course of years gathered together a large assortment of drawings, and descriptions of such Inventions. This information was published by Messrs. E. & F. N. Spon in two Vols. under the title of "Perpetuum Mobile," or the Search for Self Motive Power, during the 17th, 18th and 19th centuries. The first Vol. was issued in 1861 and the second (additional) in 1870. This work has been out of print for years and copies are very hard to find. It is considered the only authoritative work in the English language. We are fortunate in having a set in our library.

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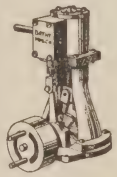

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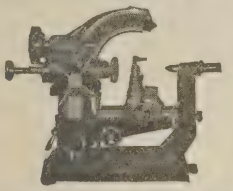

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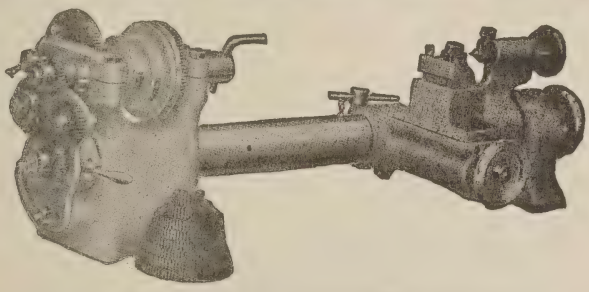

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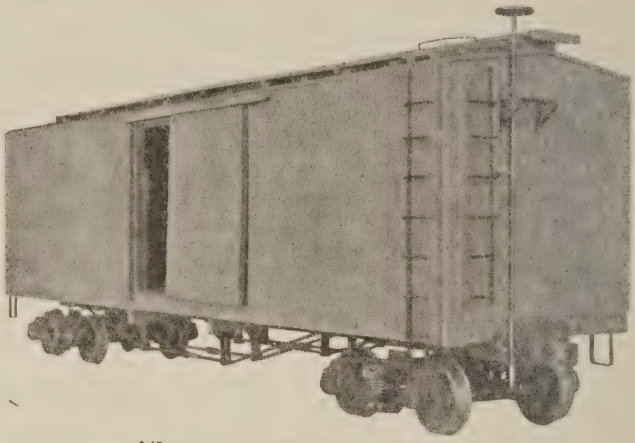

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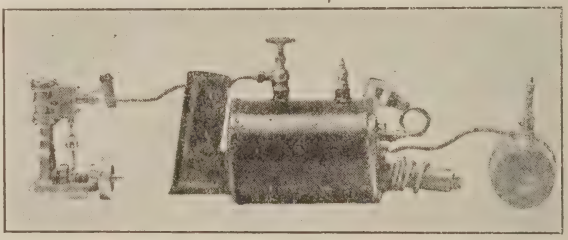

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